EUROPEAN COMMISSION
DG Competition

CASE M.8451-Tronox / Cristal

(Only the English text is authentic)

MERGER PROCEDURE
REGULATION (EC) 139/2004

Article 8(2) Regulation (EC) 139/2004

Date: 04/7/2018

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COMMISSION DECISION

of 4.7.2018

declaring a concentration to be compatible with the internal market and the EEA Agreement

(Case M.8451 – TRONOX / CRISTAL)

(Text with EEA relevance)

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(Case M.8451 – TRONOX / CRISTAL)

(Text with EEA relevance)

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THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to the Agreement on the European Economic Area, and in particular Article 57 thereof,

Having regard to Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings[1], and in particular Article 8(2) thereof,

Having regard to the Commission's decision of 20 December 2017 to initiate proceedings in this case,

Having given the undertakings concerned the opportunity to make known their views on the objections raised by the Commission,

Having regard to the opinion of the Advisory Committee on Concentrations[2],

Having regard to the final report of the Hearing Officer in this case[3],

Whereas:

1. INTRODUCTION

(1) On 15 November 2017, following a referral under Article 4(5) of Regulation (EC) No 139/2004 ("the Merger Regulation"), the Commission received notification of an intended concentration pursuant to Article 4 of that Regulation as a result of an agreement by which Tronox Limited ("Tronox", Australia) would acquire sole control, within the meaning of Article 3(1)(b) of the Merger Regulation, of the whole of the titanium dioxide business of The National Titanium Dioxide Company Ltd. ("Cristal", Saudi Arabia) by way of a purchase of shares ("the Transaction").[4] Tronox is also referred to in this Decision as "the Notifying Party" and Tronox and Cristal

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1 OJ L 24, 29.1.2004, p. 1. With effect from 1 December 2009, the Treaty on the Functioning of the European Union ("TFEU") has introduced certain changes, such as the replacement of "Community" by "Union" and "common market" by "internal market". The terminology of the TFEU will be used throughout this Decision.

2 OJ C264, 13.08.2014, p. 2-3.

3 OJ C 264, 13.08.2014, p. 4-5.

4 OJ C 438, 19.12.2017.

are together referred to as "the Parties". The undertaking that would result from the Transaction is referred to as "the merged entity".

(2) Tronox is active in the mining of inorganic minerals, including titanium feedstocks and zircon, and in the production of titanium dioxide pigment. It has two main business divisions: (i) titanium dioxide pigment, and (ii) electrolytic and specialty chemicals, of which only the former is of relevance to the Transaction. Until 1 September 2017, Tronox was also active in alkali chemicals but has now sold this business to Genesis Energy LP. Tronox is publicly listed on the New York Stock Exchange. Its largest shareholder, Exxaro, holds 44% of Tronox's shares but does not have control over the company.

(3) Cristal is also active in the mining of titanium feedstocks and zircon and in the production of titanium dioxide pigment. Cristal is a privately owned company, in which 79% of the shares are owned by Tasnee (a listed Saudi Arabian joint stock company), 20% by Gulf Investment Corporation (a company owned by the six States of the Gulf Cooperation Council) and 1% by a private individual.

2. THE TRANSACTION AND THE CONCENTRATION

(4) The Transaction would be implemented as a share transfer,[5] following an internal reorganisation within Cristal. Tronox would acquire 100% of the shares in Cristal's titanium dioxide business in exchange for cash and approximately 24% of the outstanding shares in Tronox at closing. Cristal would not have any control rights beyond the ability to exercise votes in shareholders' meetings. Cristal would have the right to appoint two of Tronox's board representatives, with board decisions requiring the affirmative vote of six directors of the board, such that Cristal would not be in a position to block decisions to be taken by the Tronox board. The Parties entered into a definitive agreement on 21 February 2017, pursuant to which the Transaction is subject to approval by Tronox's shareholders.

(5) As a result of the Transaction, Tronox would acquire sole control of Cristal's titanium dioxide business. The Transaction would therefore give rise to a concentration within the meaning of Article 3(1)(b) of the Merger Regulation.

3. UNION DIMENSION

(6) The undertakings concerned have a combined aggregate world-wide turnover of over EUR 2 500 million but not over EUR 5 000 million[6]. Only Cristal has Union-wide turnover in excess of EUR 250 million and there are not three Member States in each of which the combined aggregate turnover of the undertakings concerned is over EUR 100 million. The Transaction does not therefore have a Union dimension within the meaning of Article 1 of the Merger Regulation.

(7) In accordance with Article 4(5) of the Merger Regulation, the Notifying Party requested a referral to the Commission on the grounds that the case would be capable of being reviewed under the national competition laws of at least three Member States (Germany, Poland and the United Kingdom). The Notifying Party filed a

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5 As set out in Section 1.06 of the Transaction Agreement between The National Titanium Dioxide Company Limited and Tronox Limited, dated 21 February 2017, Tronox will transfer a combination of cash and Tronox shares to Cristal.

6 Turnover calculated in accordance with Article 5 of the Merger Regulation and the Commission Consolidated Jurisdictional Notice (OJ C 95, 16.4.2008, p. 1).

reasoned submission on 29 March 2017 that was transmitted to all Member States by the Commission on the same day. No Member State expressed disagreement with this request within 15 working days and the concentration is therefore deemed to have a Union dimension and to be notifiable in accordance with Article 4(5) of the Merger Regulation.

4. THE PROCEDURE

(8) The Notifying Party first contacted the Commission in March 2017, and submitted a Reasoned Submission requesting referral to the Commission (under Article 4(5) of the Merger Regulation) on 25 April 2017. Subsequently, once referral to the Commission had been confirmed, the Notifying Party provided the Commission with a first draft Form CO on 2 June 2017. Prior to notification of the intended concentration, the Commission conducted conference calls with approximately 30 market participants, including customers and competitors in the markets for titanium dioxide pigment, titanium feedstocks and zircon. The Commission received formal notification of the intended concentration on 15 November 2017.

(9) In its initial (Phase I) market investigation, the Commission sent questionnaires to nearly 150 market participants, including customers and competitors in the market for titanium dioxide pigment.

(10) On 20 December 2017, in view of the results of the Phase I market investigation[7], the Commission found that the Transaction raised serious doubts as to its compatibility with the internal market and the Agreement on the European Economic Area ("EEA Agreement") in relation to various markets for titanium dioxide pigment and adopted a decision initiating proceedings pursuant to Article 6(1)(c) of the Merger Regulation ("the Decision opening proceedings").[8]

(11) On 8 January 2018, the Notifying Party submitted written comments on the Decision opening proceedings ("the Response to the Decision opening proceedings").

(12) On 19 January 2018, at the request of the Notifying Party, the Commission adopted a decision extending the deadline for taking a final decision on this case by 10 working days.

(13) On 22 February 2018, the Commission adopted a decision pursuant to Article 11(3) of the Merger Regulation and Article 9(1) of Commission Regulation (EC) No 802/2004[9] suspending the time limit referred to in Article 10(3) of the Merger Regulation from 20 February 2018 until 27 February 2018. On 28 February 2018, the Commission informed the Notifying Party that the suspension of the time limit had expired on 27 February 2018, subsequent to the Notifying Party's submission of the required information on that date.

(14) In its in-depth (Phase II) market investigation, the Commission sent a second round of more targeted questionnaires to the Parties' competitors in titanium dioxide

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7 In accordance with paragraph 5.1 of the Best Practices on the conduct of EU merger control proceedings, the Notifying Party was informed of the results of the phase I market investigation at a state of play meeting held on 6 December 2017.

8 In accordance with paragraphs 45 and 46 of the Best Practices on the conduct of EU merger control proceedings, the Commission provided a number of key documents to the Notifying Party on 21 December 2017.

9 Commission Regulation (EC) No 802/2004 of 21 April 2004 implementing Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings (OJ L 133, 30.4.2004, p. 1).

pigment production and to customers purchasing titanium dioxide pigment active in the manufacture of plastics, coatings and paper laminate. In addition, the Commission held conference calls with the Parties' largest competitors and with a number of major customers in each of the three broad areas of end-use.

(15) The Commission informed the Notifying Party of the preliminary results of the Phase II market investigation during a state of play meeting held on 14 March 2018.

(16) On 16 March 2018, the Commission addressed a Statement of Objections ("SO") to the Notifying Party, in which it set out its concerns. These related to non-coordinated horizontal effects on the market for chloride-based titanium dioxide pigment for use in paper laminate and coordinated horizontal effects on the markets for rutile titanium dioxide pigment for use in coatings and plastics (and their possible sub-segmentations) and for chloride-based titanium dioxide pigment for use in paper laminate.

(17) On 19 March 2018 and thereafter on a rolling basis, the Commission provided the Notifying Party with access to file in accordance with the Commission Notice on rules for access to the Commission file.[10]

(18) On 5 April 2018, the Notifying Party submitted written comments on the SO ("the Reply to the SO").

(19) At the request of the Notifying Party, an Oral Hearing was held on 10 April 2018.

(20) The Commission subsequently identified additional facts from the body of evidence submitted by the Parties and by third parties. The Commission informed the Notifying Party of these new facts and of how it intended to interpret them in a Letter of Facts sent on 13 April 2018. The Parties submitted a joint response to this letter on 18 April 2018 ("the Response to the Letter of Facts").

(21) During a state of play meeting on 20 April 2018,[11] the Commission informed the Notifying Party that it did not maintain its preliminary concerns in relation to coordinated horizontal effects, but that it did maintain its preliminary concerns that non-coordinated effects were likely to arise on the market in the territories of the Contracting Parties to the EEA Agreement ("the EEA market") for chloride-based titanium dioxide pigment for use in paper laminate.

(22) On 24 April 2018, at the request of the Notifying Party and in order to facilitate discussions on remedies, the Commission adopted a decision pursuant to Article 10(3) of the Merger Regulation extending the deadline for its final decision by 10 working days.

(23) On 16 May 2018, the Notifying Party submitted a first set of commitments to address the significant impediment to effective competition identified by the Commission in relation to the EEA market for chloride-based titanium dioxide pigment for use in paper laminate. The market test of these commitments was launched on 17 May 2018.

(24) The Notifying Party was informed of the outcome of the market test during a call on 25 May 2018.

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[10] OJ C 325, 22.12.2005.

[11] In accordance with paragraph 5.1 of the Best Practices on the conduct of EU merger control proceedings, the Notifying Party was informed in a state of play meeting on 20 April 2018 about the Commission's position after having considered the Reply to the Statement of Objections as well as the arguments brought forward at the Oral Hearing.

(25) On 1 June 2018, the Notifying Party submitted a final set of commitments to address a number of technicalities raised during the market test.

(26) The meeting of the Advisory Committee took place on 20 June 2018.

5. INTRODUCTION TO THE ASSESSMENT ON SUBSTANCE

(27) Tronox and Cristal are two of the five major global titanium dioxide pigment producers. They both also own mineral sand mines, from which they source the titanium feedstocks for use in titanium dioxide pigment production. They are therefore vertically integrated, and also sell titanium feedstocks both to other titanium dioxide pigment producers and to other industries in which titanium feedstocks are used. In addition, Tronox and Cristal are major suppliers of zircon, a co-product of titanium mineral sands mining. Section 6 defines the relevant product and geographic markets in titanium dioxide pigment for the purposes of assessing the Transaction and then sets out the Commission's competitive assessment in those affected markets. Section 7 and Section 8 do likewise for titanium feedstocks and zircon respectively.

6. TITANIUM DIOXIDE PIGMENT

6.1. Introduction

(28) Titanium dioxide is an inorganic chemical used to opacify, brighten and whiten various industrial and consumer products. It is used in a wide range of end applications.

(29) Titanium dioxide is primarily used in the production of pigments for coatings[12] ([50-60]% of EEA sales in 2016), plastics ([20-30]% of EEA sales in 2016) and paper ([10-20]% of EEA sales in 2016).[13] In addition, it is an important input in a number of other applications, such as printing inks, catalysts, fibres, rubber, food, cosmetics and pharmaceuticals.

(30) The main steps involved in the production of titanium dioxide are the creation of base crystals, surface coating, drying and milling. There are two processes by which titanium dioxide can be produced: the chloride-based process and the sulphate-based process. In the sulphate-based process, titanium feedstocks are treated with sulphuric acid to form an intermediate product that is then calcined[14] to form titanium dioxide crystals. In the chloride-based process, titanium feedstocks are reacted with chlorine and carbon to form titanium tetrachloride ($TiCl_4$) in a continuous fluid bed reactor. The titanium tetrachloride is then purified by distillation before being oxidised to produce raw titanium dioxide crystals and chlorine gas. Additional steps involving surface coating, drying and milling are common to the chloride- and sulphate-based process.

(31) Titanium dioxide can have one of two different crystalline forms: rutile and anatase. Anatase titanium dioxide can only be produced via the sulphate-based process, while rutile titanium dioxide can be produced using either the sulphate- or the chloride-based process.

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12 For the purposes of this Decision, the term "coatings" encompasses both paints and other coatings.

13 Based on table 50 of Form CO. These figures are for rutile and anatase titanium dioxide pigment combined.

14 Reduce, oxidise, or desiccate by roasting or exposing to strong heat.

(32) Anatase titanium dioxide has a lower refractive index than rutile titanium dioxide. It refracts light less effectively, and thus does not offer the same level of opacity, whiteness and coverage. The Notifying Party estimates that anatase titanium dioxide accounts for only around [0-10]% of all sales of titanium dioxide in the EEA and around [10-20]% globally.

(33) Anatase titanium dioxide is mostly used in food, pharmaceuticals, cosmetics, fibres and catalysts, and fine and coated paper. Within the areas of use in which the Parties are active and which are therefore of relevance to this case (titanium dioxide pigment for use in coatings, plastics and paper laminate), anatase titanium dioxide is hardly used.

6.2. Market definitions

6.2.1. Product market definition

6.2.1.1. The Commission's past practice

(34) In the SO, the Commission summarised relevant previous Decisions and noted that in previous cases the Commission had differentiated between titanium dioxide pigment used in mass applications (including coatings and plastics) and titanium dioxide pigment used in other applications.

6.2.1.1.1. The Notifying Party's view

(35) In the Reply to the SO, the Notifying Party disputed the Commission's interpretation of previous Decisions. It maintained that paper laminate had been regarded in the past as part of the mass applications market. On that basis, the Notifying Party argued that the Commission should explain its reasons for departing from its previous finding.[15]

6.2.1.1.2. The Commission's assessment

(36) The Commission considers that "mass applications", in the context of titanium dioxide pigment end-uses, refers only to applications in coatings and plastics, and that this conclusion is in line with its previous Decisions.

(37) The Commission analysed titanium dioxide pigment markets in a number of previous cases[16] and considered various potential product markets within the market for titanium dioxide pigment, defined on the basis of end-use and/or production process.

(38) In its most recent case in this area, *Huntsman/Rockwood*[17], the Commission discussed the possibility of defining separate product markets by production process, distinguishing between chloride-based titanium dioxide pigment and sulphate-based titanium dioxide pigment. The Commission concluded in that case that there was no supply-side substitutability between titanium dioxide pigment manufactured via the sulphate-based process and titanium dioxide pigment manufactured via the chloride-based process as the two processes use entirely different technology, require different expertise and have different costs.[18] In relation to demand-side substitutability, the

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15 Reply to the SO, paragraphs 82-84.

16 Commission Decision Cases: M.23 – *ICI/Tioxide* of 28 November 1990, M.984 – *DuPont/ICI* of 2 October 1997, M.5638 – *Huntsman/Assets of Tronox* 18 December 2009 and M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings* of 10 September 2014.

17 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014.

18 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraphs 85-89.

Commission noted that "there is a certain degree of demand substitutability as concerns the mass applications, whereas such substitutability is limited for specialty applications".[19] The Commission further noted that titanium dioxide pigment produced via the sulphate-based process and titanium dioxide pigment produced via the chloride-based process could be used "almost interchangeably in the vast majority of mass applications", albeit with a number of exceptions.[20]

(39) In relation to end-use, the main focus of the Commission's assessment in *Huntsman/Rockwood* was on one speciality application, namely printing inks.[21] Although the Commission considered this application to be different from "mass applications", it left the precise market definition of these "other markets for TiO_2" open[22] as Huntsman and Sachtleben (Rockwood) were only marginally active in those areas.[23] Insofar as the Commission considered mass applications in that case, it clearly referred in its own assessment of the relevant markets[24] to coatings and plastics, and their respective narrower possible subsegments (architectural, industrial and thin film coatings,[25] and polyolefin, PVC and engineering plastics[26]) only. The market for titanium dioxide pigment for paper (and any possible subsegments of that market)[27] was not analysed as it was not of relevance to that case. Moreover, the implicit inclusion of paper laminate in speciality rather than mass applications in that case is evident from the reference to the Commission having "identified three main categories of TiO_2 end-applications: coatings, plastics and specialty applications."[28]

(40) In an earlier case, *DuPont/ICI*[29], the Commission found, similarly, that "for the majority of end-use applications both sulphate and chloride-produced TiO_2 can be used" but that "there are certain specific applications where either chloride or sulphate-produced TiO_2 is preferred".[30] In that case, the Commission considered "mass applications" to be the production of coatings and plastics, whilst "specialty

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19 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 68.

20 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 494.

21 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 104.

22 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 498.

23 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, footnote 695.

24 In as far as the Commission also mentioned plastics, coatings and paper in relation to "mass-applications", it did so not in its own assessment but in a general introduction section, referring to data provided by the Parties (Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 24, including footnote 10).

25 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 487.

26 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 488.

27 As stated in the Commission's summary of the Notifying Party's view in that case (Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 489).

28 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 40.

29 Commission Decision Case M.984 – *DuPont / ICI*, 2 October 1997.

30 Commission Decision Case M.984 – *DuPont / ICI*, 2 October 1997, paragraph 34.

applications" was defined as including "inks, paper, laminates and fibre applications".[31]

(41) In *DuPont/ICI*, the Commission also noted that different grades of titanium dioxide pigment typically vary in terms of their technical characteristics, and the uses for which they are marketed. It was observed that a number of grades could often be grouped together as being suitable for one particular "category of applications", and that this would therefore be the level at which demand-side substitutability should be evaluated. The question whether specific areas of use constituted separate markets was, however, ultimately left open.[32]

(42) The Commission considers that it is appropriate to segment the market for the production of titanium dioxide pigment according to: (i) crystalline form, (ii) production process, and/or (iii) the end-application in which the titanium dioxide is used. The Commission identifies a separate market for chloride-based titanium dioxide for use in paper laminate, in line with the approach adopted in *DuPont/ICI* and *Huntsman/Rockwood*, where it was recognised that the end-application and the production process (in particular where speciality applications are concerned) may be relevant for market definition.

6.2.1.2. Segmentation between rutile and anatase crystalline forms

(43) Overlaps between the Parties' activities relate exclusively to rutile titanium dioxide as Tronox manufactures titanium dioxide pigment using only the chloride process, meaning that it cannot produce anatase titanium dioxide pigment.

6.2.1.2.1. The Notifying Party's view

(44) The Notifying Party acknowledges that rutile titanium dioxide pigment is substitutable to only a limited extent with anatase titanium dioxide pigment and that rutile pigment is preferred to anatase pigment for most end-applications as it offers better opacity.

6.2.1.2.2. The Commission's assessment

(45) The Commission considers it appropriate to define separate markets (or sets of markets) for rutile- and anatase-form titanium dioxide pigment because only rutile grades have the qualities needed for the majority of end-applications, including coatings, plastics and paper laminate. As explained by a customer, rutile grades offer "better durability, better dispersibility, better wet opacity, higher refractive index".[33]

(46) The results of the market investigation further show that customers use almost exclusively rutile titanium dioxide pigment for the production of coatings, plastics and paper (with the potential exception of fine[34] and coated paper, neither of which is relevant for this Decision).[35] The vast majority of respondents are of the opinion that anatase titanium dioxide pigment would be unsuitable for use in their production processes, and could very rarely be used as a substitute for rutile titanium dioxide pigment.[36] The main reasons cited for this were that anatase grades are typically

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31 Commission Decision Case M.984 – *DuPont / ICI*, 2 October 1997, paragraph 36.

32 Commission Decision Case M.984 – *DuPont / ICI*, 2 October 1997, paragraphs 40-42.

33 Questionnaire 1 to titanium dioxide customers, Q12, ID 1247.

34 Over [the vast majority] of Cristal's sales of titanium dioxide grades for use in fine paper are anatase grades. These can only be produced via the sulphate-based process in which Tronox is not active. There is therefore no overlap in relation to anatase titanium dioxide for use in fine paper applications.

35 Questionnaire 1 to titanium dioxide customers, Q13.

36 Questionnaire 1 to titanium dioxide customers, Q12-13.

inferior with respect to almost all the characteristics of titanium dioxide that are important for use in plastics, paper and coatings, such as whiteness, opacity, dispersion and durability.[37]

(47) In the light of the results of the market investigation and taking the other evidence available to it into account, the Commission considers that, for the purposes of this Decision, rutile and anatase pigments do not belong to the same product market. In light of the activities of the Parties, only rutile titanium dioxide pigment is relevant to this Decision.

6.2.1.3. Existence of a separate market for chloride-based titanium dioxide pigment for use in paper laminate

(48) The Commission considers that it is appropriate to define a separate market for chloride-based titanium dioxide pigment for use in paper laminate. First, titanium dioxide pigment grades used in paper laminate are distinct from those used in other applications (both mass applications and other speciality applications). Second, sulphate-based grades designed for use in paper laminate are not a satisfactory substitute for chloride-based grades, and there is no supply-side substitutability between chloride- and sulphate-based grades.

6.2.1.3.1. Segmentation between titanium dioxide pigment for use in paper laminate and titanium dioxide pigment for use in other end-applications

The Notifying Party's view

(49) The Notifying Party claims that the same characteristics of titanium dioxide pigment, in particular opacity and colour, are important to customers in all of the broad segments identified as being of relevance to this case, and thus in both paper laminate and other areas.

(50) The Notifying Party acknowledges that different grades of titanium dioxide pigment are developed with different end-applications in mind, but argues that almost all of the grades sold by the Parties and their competitors are sold to customers active in at least two of the three broad areas of end-use (coatings, plastics and paper). Whilst recognising that sales of any particular grade are often weighted towards one of these three sectors, the Notifying Party maintains that there is no clear correspondence between grades and end-use.[38]

(51) The Notifying Party also submits that the prices of grades used for different applications are similar, and that they move in parallel, despite other demand- and supply-side factors that could be expected to cause prices to evolve differently. In the Reply to the SO, the Notifying Party argued that the alleged high correlation between the prices of various grades demonstrated that grades used in different end applications belong to the same product market.[39]

(52) It would seem that the Notifying Party contests the assessment presented by the Commission in the SO that the apparent parallel movement of prices for different grades used for different applications is not a direct indication of demand-side

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[37] Questionnaire 1 to titanium dioxide customers, Q12, Q14: customers consistently stated that abrasiveness is the particular characteristic of anatase titanium dioxide pigment. This makes it especially well-suited to certain niche applications but it is not an advantage for use in plastics, coatings and paper laminate.

[38] Form CO, paragraphs 278-279 and related annexes to the Form CO (Annex 6.2-26, Annex 6.2-27 and Annex 6.2-28).

[39] Reply to the SO, paragraphs 116-123.

substitutability. The Notifying Party also rejects the arguments put forward by the Commission in relation to a number of weaknesses identified in the price correlation analysis carried out by the Notifying Party. In particular, the Notifying Party rejects the Commission's conclusions on the grounds set out in recitals (53) to (56).[40]

(53) Firstly, the Notifying Party claims that looking at price differences instead of price levels does not solve the "common factor problem".[41] Instead, the impact of common factors needs to be filtered out explicitly and this should be done by looking at the correlation between the residuals of the regression of prices on common factors ("partial correlation analysis") and the correlation between the first differences of these residuals. The Notifying Party therefore used titanium feedstock market data and plant-level energy data to control for common supply-side factors and used quarterly time dummies to control for common demand-side factors.[42]

(54) Secondly, the Notifying Party contests the use of monthly prices due to the potentially significant "noise" that they include and the inconsistency with the quarterly price negotiations prevalent in the industry. The Notifying Party therefore proposes the use of quarterly average prices. By applying these two modifications to the Commission's analysis, the Notifying Party finds that, irrespective of whether residuals of price regressions on common factors or the first differences of these residuals are considered, the correlation coefficients between each of the Parties' paper laminate grades and their respective coating or plastic grades fall within the interval determined by the correlation coefficients between that Party's individual coating or plastic grades.[43]

(55) In addition, the Notifying Party claims that, when common demand- and supply-side factors that affect the prices of various grades belonging to different end-applications are taken into account, it can be concluded that the observed high correlation between the prices of various grades is most likely to be explained by the fact that these grades exert a strong competitive constraint on one another, and that the arguments according to which price correlation analysis could be, at best, used to demonstrate that a product *does not* belong to a particular market, should be dismissed. On that basis, the Notifying Party claims that the results of its analysis lend "strong support to the conclusion that the paper laminate end-use belongs to the same relevant market as the mass applications market defined in the SO".[44]

(56) Finally, the Notifying Party argues in the Reply to the SO that there is significant supply-side substitutability between titanium dioxide pigment for use in paper laminate and for use in other end-applications, at least when considering suppliers that already produce paper laminate grades. The Notifying Party claims that these producers could easily increase the volume of paper laminate grades produced by "extending the run time" of the production of a specific grade.

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40 Reply to the SO, paragraphs 116-123.

41 The "common factor problem" refers to the fact that time series may be correlated due to each being subject to a common phenomenon or trend. In the case of price evolution, high correlation between the prices of two different products could be spurious as it might be driven by changes in common input costs or common demand factors rather than any substitutability between the different products.

42 Reply to SO, Appendix A (RBB Price correlation analysis – paper laminate).

43 Reply to SO, Appendix A (RBB Price correlation analysis – paper laminate).

44 Reply to SO, Appendix A (RBB Price correlation analysis – paper laminate), p3.

The Commission's assessment

(57) On the basis of the results of the market investigation, the Commission considers there to be only very limited demand-side substitutability between titanium dioxide pigment for use in paper laminate and titanium dioxide pigment for use in other end-applications.

(58) First, responses to the market investigation show that the requirements of paper laminate customers differ significantly from those of customers active in other areas (not only plastics and coatings, but also other types of paper, for example fine paper and coated paper).

(59) The vast majority of respondents to the market investigation active in paper laminate stated that they would only consider products targeted at their industry.[45] They explained that paper laminate production requires grades that are specially coated to provide lightfastness,[46] and that this distinguishes paper laminate grades from those used in other areas.[47] One customer stated, for example, that "we need to have TiO2 with very good opacity and with very high lightfastness. Only [TiO2 grades targeted at our industry] fulfil requirements of our customers."[48] When explaining why they would not be able to use grades designed for use in other areas, customers again referred to the need for lightfastness. Grades designed for other applications are known not to be lightfast and would therefore be unsuitable for the production of paper laminate.[49] Another customer stated, for example, that "grades for coating and plastic application are generally not suitable for use in laminate paper application".[50]

(60) Second, when confronted with a hypothetical situation in which the price of all grades of titanium dioxide pigment specifically designed for use in paper laminate were to increase, whilst other grades were to remain at the same price,[51] a large majority of respondents (representing 85% of the overall EEA demand for titanium dioxide pigment for use in paper laminate) submitted that they would not change their purchases at all, thus suggesting that paper laminate grades are essential for their production.[52] Furthermore, when the same question was asked in relation to grades suitable for use in high white paper laminate, all customers active in paper laminate production stated that they would continue to purchase the same amounts of the grades they buy currently.[53] This confirms that for paper laminate in general, and particularly for white paper laminate, customers have very little, if any, flexibility with respect to the grades they use.

(61) Only one respondent said that they bought grades targeted at other end-uses,[54] but noted that this had consequences for the quality of the end product as using these other types of titanium dioxide pigment reduces lightfastness.[55]

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45 Questionnaire 6 to titanium dioxide customers in paper laminate, Q7.

46 Questionnaire 1 to titanium dioxide customers, Q17. Questionnaire 6 to titanium dioxide customers in paper laminate, Q7.1.

47 Questionnaire 6 to titanium dioxide customers in paper laminate, Q27.

48 Questionnaire 6 to titanium dioxide customers in paper laminate, Q7.1, ID 2556.

49 Questionnaire 6 to titanium dioxide customers in paper laminate, Q30.3.

50 Questionnaire 1 to titanium dioxide customers, Q16.1, ID 2536.

51 The 'SSNIP' test.

52 Questionnaire 6 to titanium dioxide customers in paper laminate, Q26.

53 Questionnaire 6 to titanium dioxide customers in paper laminate, Q29.

54 Questionnaire 6 to titanium dioxide customers in paper laminate, Q30.1, ID 2560.

55 Questionnaire 6 to titanium dioxide customers in paper laminate, Q30.3, ID 2560.

(62) Third, the way in which the Parties and their competitors present their marketing materials, their sales figures and internal documentation also suggests that paper laminate grades are marketed specifically at customers in this industry. The technical data sheet for Tronox's grade 8120 describes it as "a product developed specifically for decorative paper[56] applications".[57] Similarly, the product data sheet for Cristal's grade RCL-722 states that it is "specially designed for use in the production of décor paper and laminates".[58] There is no mention of décor paper or laminates in the technical/product data sheets for any of the other Tronox and Cristal grades. The marketing information provided by competitors also strongly suggests that grades suitable for use in paper laminate are targeted almost exclusively at this industry, and, similarly, that other grades would not even be claimed to be suitable. The product information sheet for Chemours' R-796+ grade states that it "provides excellent opacity and retention and is suitable for use in high and low pressure décor papers".[59] Kronos' product description for its grade 2800, meanwhile, describes it as being "designed for décor papers and décor foils".[60] For Kronos and Chemours, as for the Parties, there were no other grades where reference was made to paper laminate in the product description.[61] More generally, the vast majority of competitors confirmed that they market each of their grades of titanium dioxide at customers active in specific end-applications.[62]

(63) The Parties' sales figures also indicate that paper laminate customers buy almost exclusively grades marketed for use in this end-application, and that these grades are sold almost exclusively to those customers. Just over […]% of sales of Tronox's grade 8120 were made to customers active in paper production. […]. Similarly, Cristal's grade RCL722 was also sold almost exclusively ([…]% of sales) to paper customers.[63]

(64) Internal documents provided by Tronox also indicate that paper laminate is a very specific area of end use for which only its 8120 grade is considered suitable. […][64] […].[65] Three different areas of application are identified within paper laminate: highly pigmented decorative papers, pre-impregnated foils and lamination printing inks. The grade 8120 is the only grade identified as being suitable for use in these areas (and this grade is also not indicated as being suitable for any of the plastics or coatings applications).

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56 "Decorative paper" and "décor paper" are terms synonymous with paper laminate.

57 The Response to the Decision opening proceedings, Annex 2: Tronox grades and technical data sheets.

58 The Response to the Decision opening proceedings, Annex 3: Cristal grades and technical data sheets.

59 The Response to the Decision opening proceedings, Annex 4: Chemours grades and technical data sheets.

60 The Response to the Decision opening proceedings, Annex 6: Kronos grades and technical data sheets; the only other Kronos grade where any reference is made to paper laminate is Kronos 2056, which is described as being suitable for use specifically in "impregnating baths for paper laminates".

61 The only other Chemours grades (of those for which the Notifying Party provided information) where décor papers or laminate are referred to are R794 and R796, the predecessors to R796+.

62 Questionnaire 9 to titanium dioxide competitors, Q51.

63 The only other Cristal grades purchased in significant volumes by customers active in paper production were Cristal's […], which the Notifying Party explains are used in fine and coated paper (applications where […] are strongly preferred).

64 Internal documents provided in response to RFI6; ID 548-31709.

65 The list includes around […] different end-uses of titanium dioxide pigments, for each of which different grades would be suitable/preferred. The end-uses are defined narrowly and include, for example: […].

(65) Fourth, with respect to the alleged price correlation between grades, the Commission considers that the apparent parallel movement of the prices of grades used in different end applications is not a direct indication of demand-side substitutability. In particular, the Commission considers that the main reason for the parallel movement of prices is likely to be variation in common supply-side factors (such as common costs) or demand-side factors (e.g. changes in certain macro-economic variables that influence demand or similar changes in conditions in various downstream industries). As a result, the Commission considers that, insofar as price correlation between various grades needs to be assessed, it is more appropriate to look at the correlation of price first differences rather than the correlation of prices.

(66) The Commission found, by looking at monthly price first differences covering the period 2012-2017, that the price first difference of Tronox's paper laminate grade 8120 is less strongly correlated with (i) the average price first difference of Tronox's coating grades […] than the latter two are with each other ([…] and […] vs. […]); and with (ii) the average price first difference of Tronox's plastic grades […] than the latter two are with each other ([…] and […] vs. […]).

(67) Finally, as explained in *Huntsman/Rockwood*, the Commission considers that price co-movement and the associated price correlation analysis has severe limitations in terms of its use for market definition, and that price correlation can only provide (indirect) evidence for the separation of a product from a particular market, but not for the inclusion of a product in a market.[66]

(68) In response to the arguments presented in the Reply to the SO, the Commission acknowledges that, given the timing of price negotiations with customers, looking at quarterly data is likely to be more appropriate than looking at monthly data for the purposes of price analysis.[67]

(69) The Commission accepts the argument that looking at price first differences does not solve the issue of the potential impact of common factors on price co-movement and that partial correlation analysis, including first differencing, is the right way to tackle the problem.[68] However, in this two-step exercise, first differencing should be the first step and controlling for common factors through a regression analysis should be the second step. By changing this order, i.e. by filtering out common factors first and then first differencing the obtained residuals afterwards, the residuals examined by the Notifying Party were obtained from spurious regressions and were therefore likely to be biased, leading to unreliable results.

(70) When controlling for common factors that could potentially influence the co-movement of titanium dioxide pigment prices, the Commission acknowledges that the Parties' analysis controls for feedstock prices and also includes quarterly dummies.[69] However, such control variables may not sufficiently control for all common shocks. In particular, quarterly time dummies may not sufficiently control

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66 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 146.

67 However, the fact that monthly data contains more noise should not be a problem *per se*, as highly variable monthly data can very often better capture asymmetric shocks that could trigger quantity and price adjustments for other grades, which in turn better captures price adjustments required for market definition.

68 Nonetheless, one needs to look at price first differences instead of price levels if prices follow any type of trend.

69 The Parties should have also clarified why the remaining cost factors do not have components that are common for the various grades.

for common demand shocks during 2016 and 2017, when prices were increasing continually but not triggered by an increase in costs. The Commission does therefore not consider the correlation analysis submitted by the Notifying Party to be informative.

(71) Finally, the Commission also rejects the Notifying Party's claim that properly controlling for common demand-side and supply-side factors, something which the Notifying Party failed to do in this case, could serve to overcome the arguments supporting the "one-sided" nature of the price correlation analysis and that the high correlation of prices of grades belonging to different end-applications should be viewed as "strong support to the conclusion that the paper laminate end-use belongs to the same relevant market as the mass applications market defined in the SO". In particular, even by properly controlling for common demand-side and supply-side factors, a high correlation of prices (or their first differences) cannot be considered as strong evidence for inclusion of a product in a relevant market. One reason is that the inherent arbitrage argument does not take into account the impact on quantities of any price increase event and fails therefore to be consistent with the logic of the SSNIP-test.[70,71]

(72) The Commission therefore concludes that there is very limited demand-side substitutability between grades of titanium dioxide pigment for use in paper laminate and grades of titanium dioxide pigment for use in other areas, and that would be true even if prices between paper laminate grades and mass application grades were as closely correlated as prices are for different mass applications (*quod non*).

(73) As regards potential supply-side substitutability, the arguments presented by the Notifying Party are not convincing. First, the arguments presented by the Notifying Party are contradictory. The Notifying Party argued that there is strong supply-side substitutability across different types of grades[72] while at the same time admitting that [information on configuration of different production lines].[73] shows that supply-side substitutability is at least significantly more limited than the Notifying Party suggests.

(74) Second, and even more importantly, the argument that some suppliers that are already active in the production of a specific grade may increase their production by shifting volumes to the detriment of other products is a question of production expansion and should accordingly be discussed in the competitive assessment.

6.2.1.3.2. Segmentation between chloride-based and sulphate-based titanium dioxide pigment for use in paper laminate

(75) In the SO, the Commission came to the preliminary conclusion that a separate market exists for those titanium dioxide pigments for use in paper laminate applications that are produced using the chloride-based process. In line with the Commission Notice

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70 In particular, a high price correlation (if all the required controls are implemented) may signal competitive pressure, however, without examining quantity changes it does not give indication about the intensity of this competitive pressure and whether the SSNIP-test lying at the basis of market definition would be satisfied.

71 In case of separation from the relevant market point of view, the role of the impact on quantities is less important as weakly or negatively correlated prices are not claimed to exert competitive pressure on each other.

72 Reply to SO, paragraphs 99-113.

73 Reply to SO, paragraph 237.

on the definition of the relevant market,[74] the Commission starts with those products the undertakings concerned actually sell.[75] In this case, this restricts the initial market definition to chloride-based titanium dioxide pigment for use in paper laminate. It should therefore be noted that demand-side substitutability has to be assessed in terms of whether chloride-based titanium dioxide pigment used in paper laminates can be replaced by sulphate-based titanium dioxide pigment.

The Notifying Party's view

(76) The Notifying Party submits that (i) the majority of customers (around [60-80]%) active in the production of paper laminate use both sulphate and chloride grades; (ii) although opacity is a critical requirement for paper laminate customers, there are sulphate grades that can perform as well as chloride grades in this respect, and this does not therefore constitute a justification for defining a separate market; and (iii) only [40-60]% of paper laminate produced is white, and, even for these products, up to [0-20]% of the titanium dioxide pigment used can be sulphate-based.

(77) The Notifying Party acknowledges, nonetheless, that there are, in its view, a small number of areas of use where chloride-based titanium dioxide pigments may be preferred, one of which is décor paper applications, where colour and brightness is particularly important.

(78) The Notifying Party further submitted in the Reply to the SO that suppliers cannot price discriminate on the basis of the product in which their grades are used as they do not know the proportions of purchases used by customers in coloured and in white paper laminate respectively. The Notifying Party argues that this would prevent suppliers from increasing prices for chloride-based grades for use in paper laminate as they would never know how easily the customer could switch to sulphate-based grades.[76]

(79) Finally, the Notifying Party also argues that "sulphate-based suppliers" could increase their production of paper laminate grades, when discussing potential supply-side substitutability.[77]

The Commission's assessment

(80) The Commission considers that customers active in paper laminate production would not switch from chloride-based to sulphate-based products for a range of reasons, including both the technical difficulties associated with using sulphate-based products and the preferences of those customers' own customers for end products with certain characteristics.

(81) First, customers active in paper laminate production indicated that they were very restricted in the extent to which they could use sulphate-based titanium dioxide in the production of paper laminate, particularly for white paper laminate, because of the particular characteristics only offered by chloride-based products.

(82) In their responses to the market investigation, customers consistently indicated that chloride-based grades offer superior performance compared with sulphate-based grades and that the specific properties that chloride-based grades confer on the end

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74 OJ C 372, 9.12.1997.

75 See paragraph 15 et seq. of the Commission Notice on the definition of the relevant market (OJ C 372, 9.12.1997).

76 Reply to SO, paragraphs 132-137.

77 Reply to SO, paragraph 101.

product make them better suited to the production of paper laminate.[78] The main reason for this is that chloride-based titanium dioxide pigment is generally whiter and brighter than sulphate-based grades, and this is a critical characteristic for the production of paper laminate. While sulphate-based pigment can have a yellow tone, which makes it unsuitable for use in most paper laminate applications for aesthetic reasons, chloride-based pigments are typically blue-toned and provide better opacity, thus giving a cleaner and brighter appearance.[79] One customer explained, for example, that "the sulphate grade is more yellowish compared to the chloride grade, and therefore cannot be used in all applications".[80] Another respondent also reported that "the importance of chloride grades is that they ensure a higher degree of lightfastness, i.e. resistance to the light of the sun. If the TiO_2 used for paper is not of sufficient quality, the paper can turn yellow."[81] The vast majority of respondents to the market investigation were of the opinion that sulphate-based grades have a yellow undertone,[82] which creates problems, particularly in high white paper laminate.[83] [84]

(83) In the Reply to the SO, the Notifying Party similarly acknowledged that the colour difference between sulphate and chloride grades, while still relatively small, is more significant than it is between different chloride-based grades, and is above the threshold of visibility (Delta-E* value above 1).[85]

(84) In general, customers described replacing chloride-based grades with sulphate-based grades as "nearly impossible"[86] and explained that it would "influence the paper quality".[87] This was further confirmed by the following statement made by a major customer: "only the highest quality TiO_2 can be used in the production of decorative paper, and this is chloride-based TiO_2. Chloride and sulphate grades therefore represent two different markets, as the chloride process offers a product of better quality and stability."[88]

(85) The Notifying Party maintained in the Reply to the SO that the technical properties of sulphate-based grades are comparable to those of chloride-based grades.[89] All major customers disagreed with that view and expressed no doubts as to the difference in quality between chloride- and sulphate-based grades. The Commission

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78 Questionnaire 1 to titanium dioxide customers, Q6, Q11. Questionnaire 6 to titanium dioxide customers in paper laminate, Q5, Q22, Q23. Minutes of call with titanium dioxide customer, 25 August 2017, 11.00, ID 1214.

79 While sulphate-based pigment can have a yellow tone, which is a disadvantage for aesthetic reasons, chloride-based pigments are typically blue-toned and provide better opacity, thus giving a cleaner and brighter appearance. See Questionnaire 1 to titanium dioxide customers, Q6.

80 Questionnaire 1 to titanium dioxide customers, Q6, ID 2536.

81 The same customer also noted that "only the highest quality TiO_2 can be used in the production of decorative paper, and this is chloride-based TiO_2. Chloride and sulphate grades therefore represent two different markets, as the chloride process offers a product of better quality and stability." Minutes of call with titanium dioxide customer, 25 August 2017, 11.00, ID 1214.

82 Questionnaire 6 to titanium dioxide customers in paper laminate, Q23.

83 Questionnaire 6 to titanium dioxide customers in paper laminate, Q22, ID 2556.

84 Similarly, other customers noted that using "more sulphate grades would not allow us to meet our customer specifications in terms of optical properties" and "in high white laminate paper grades, chloride pigments cannot be substituted". See Questionnaire 1 to titanium dioxide customers, Q11, ID 2519 and 2536.

85 Reply to SO, paragraph 228.

86 Questionnaire 6 to titanium dioxide customers in paper laminate, Q5, ID 2557.

87 Questionnaire 6 to titanium dioxide customers in paper laminate, Q5, ID 2555.

88 Minutes of call with titanium dioxide customer, 25 August 2017, 11.00, ID 1214.

89 Reply to SO, paragraphs 138-140.

does not consider that the Notifying Party has provided sufficiently compelling arguments to justify ignoring the fully conclusive result of the market investigation.

(86) Second, contrary to the Notifying Party's claim that the problem created by the yellow colour of sulphate-based titanium dioxide pigments can be solved by adding blue toners, customers explained that this would reduce the whiteness and brightness of the end product. One customer stated, for example, that "[i]t is impossible to add blue toners (it is hard to dose). We do not do it in practice."[90]

(87) Third, the results of the market investigation suggested that the proportion of paper laminate production that white paper laminate accounts for is higher than claimed by the Notifying Party. Whilst the Notifying Party maintains that white paper laminate represents around [30-50]% of production, responses from customers suggest that it could be much higher, even up to around 80% for one major customer.[91] This customer also explained that high white paper laminate is currently the fastest growing segment of the market for the industry in general, as a result of changing consumer tastes.[92]

(88) Fourth, customers active in the production of paper laminate indicated that the proportion of their current purchases of chloride-based grades that they could replace with sulphate-based grades is very limited.[93] One customer stated that "the grades that […] purchases are specific to paper laminate production. Even if […] could substitute some of the chloride titanium pigment it uses with sulphate-based pigment, it would never be able to do without chloride-based TiO2".[94]

(89) Respondents to the market investigation highlighted that the proportion of sulphate grades that can be used in paper laminate production varies between customers and between types of paper laminate. Most respondents stated that they can use a slightly higher proportion of non-paper laminate (and potentially sulphate-based) grades in coloured paper laminate but very little, and sometimes none at all, in white paper laminate.[95] One customer stated, for example, that "in high white paper laminate grades, chloride pigments cannot be substituted",[96] and another expressed a similar view, explaining that "for white paper – only chloride type of TiO2 [can be used] because: high whiteness, high opacity, high lightfastness".[97]

(90) Fifth, when faced with a hypothetical situation in which the price of chloride grades were to increase, while sulphate grades remained at the same price level, the majority of respondents stated that they would not change their purchase volumes.[98] Only a small minority of customers reported that they could slightly increase the overall proportion of sulphate grades they buy, but one noted that this would depend on the type of paper, and that there would be costs associated with this.[99] On the basis of the responses to the market investigation,[100] the Commission estimates that the sales of

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90 Questionnaire 6 to titanium dioxide customers in paper laminate, Q23.1, ID 2556.

91 Questionnaire 6 to titanium dioxide customers in paper laminate, Q3, ID 2560.

92 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.

93 Questionnaire 1 to titanium dioxide customers, Q11.

94 Minutes of call with titanium dioxide customer, 7 July 2017, 9.30, ID 1260.

95 Questionnaire 6 to titanium dioxide customers in paper laminate, Q4, Q21, Q22.

96 Questionnaire 1 to titanium dioxide customers, Q11, ID 2536.

97 Questionnaire 6 to titanium dioxide customers in paper laminate, Q22, ID 2556.

98 Questionnaire 6 to titanium dioxide customers in paper laminate, Q24.

99 Questionnaire 6 to titanium dioxide customers in paper laminate, Q24.1, ID 1692.

100 The six respondents to Q24 of Questionnaire 6 to titanium dioxide customers in paper laminate accounted for 89% of all purchases of titanium dioxide pigment for use in paper laminate in the EEA in

chloride-based grades that could be replaced by sulphate-based pigment represent only around 2% of total purchases of chloride-based grades for use in paper laminate in the EEA.[101] This is a very strong indication that customer reaction would be by no means sufficient to render unprofitable a potential price rise in chloride-based titanium dioxide pigment for use in paper laminate by a hypothetical monopolist.

(91) The Notifying Party falsely claims that the Commission stated in the SO that there is substitutability between chloride- and sulphate-based grades for a small proportion of paper laminate production.[102] In fact, the Commission stated that customers currently use sulphate-based grades for a small proportion of their production.[103] This does not imply that they could increase the overall proportion of sulphate-based grades they use or that any of their current purchases of chloride-based grades could be replaced by sulphate-based grades. As such, the Notifying Party's rejection of the results of the SSNIP test is unfounded.[104] Whether customers active in the production of paper laminate already purchase sulphate-based grades is not decisive for the definition of the relevant market. It is not the current total volumes procured (and used for different types of applications) by customers that is relevant, but rather their ability and willingness to shift additional incremental volumes in reaction to a hypothetical price increase.

(92) In the light of recitals (81) - (90), the examples provided by the Notifying Party in the Reply to the SO of customers' responses illustrating their current ability to use sulphate-based grades for some of their production is irrelevant for the definition of the product market.[105] The Commission does not dispute, and in fact acknowledged in the SO, that customers are able to use a certain proportion of sulphate-based grades. However, this does not have any bearing on the market definition, the critical point being that customers cannot switch sufficient volumes of current purchases of chloride-based grades to sulphate-based grades to defeat a hypothetical price increase in the chloride-based grades.

(93) The Notifying Party also claims in the Reply to the SO that there are examples of customers switching from chloride-based to sulphate-based grades, and that […] have lost customers as a result of their switching to sulphate-based grades.[106] The examples of such losses are, however, unclear. The example given in relation to Cristal's lost volumes does not in fact specify whether or not these were to sulphate-based suppliers, and the example given for Tronox relates to […]. Furthermore, no internal documents or market intelligence were provided to substantiate the claim that these sales were lost to […].

(94) Sixth, customers were almost unanimous in stating that they would not be able to leverage their ability to switch significant volumes of chloride-based titanium dioxide pigment to sulphate-based grades in order to negotiate better prices. Many

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2016. The Commission has no reasons to believe that the replies received in response to this question would not be representative for the remaining customers.

101 Based on replies of customers active in paper laminate production, and in particular to Q24 of Questionnaire 6 to titanium dioxide customers in paper laminate, the Commission had access, for each of the six respondents to Q24, to the total volume of purchased chloride-based grades for use in paper laminate and to the total volume thereof that each of these customers would replace with sulphate-based grades following a hypothetical price increase of chloride-based grades by 5-10%.

102 Reply to SO, paragraph 129.

103 SO, paragraph 76.

104 Reply to SO, paragraphs 129-131.

105 Reply to SO, paragraphs 141-144.

106 Reply to SO, paragraphs 157-160.

did not believe that threatening to switch would even have any effect. One customer stated, for example: "All chloride-based TiO2 suppliers know that we need their grades to produce quality paper."[107]

(95) In the Reply to the SO, the Notifying Party claimed that suppliers' lack of knowledge of the particular product in which customers are using their grades (in particular whether it is white or coloured paper laminate) and in what proportion, would mean that customers' potential ability to switch would prevent suppliers from increasing prices.[108] This is not a valid argument, however, as both recital (94) and the results of the SSNIP test show that customers could switch no or only a very small proportion of their current purchases of chloride-based grades to sulphate-based grades, irrespective of the product in which they are using the grades purchased. Whilst it is true, in general, that a higher proportion of sulphate-based grades can be used in coloured paper laminate than in white paper laminate, given that suppliers are already using the maximum possible in each application as suggested by both recital (94) and the results of the SSNIP test, this has no effect at all on their ability to increase the overall proportion of sulphate-grades used.

(96) Seventh, customers' inability to switch to using sulphate-based grades for anything more than a very small proportion of their usage, and only in certain products, is also reflected in the comments they make with respect to Chinese suppliers, given that Chinese suppliers do not offer any chloride-based grades for use in paper laminate.[109] Most customers active in paper laminate production reported that Chinese suppliers do not offer any grades that are suitable for their use and are not, therefore, a credible alternative to established competitors.[110]

(97) Eighth, evidence from the market investigation also shows that, even the sulphate-based grades, such as Venator's 610L and Lomon Billions LR-952, which the Notifying Party claims […], are generally not perceived by customers as a credible alternative to Tronox and Cristal's paper laminate grades. Moreover, the only other grades identified by customers as alternatives were the two other chloride-based grades marketed for this segment, namely Chemours R-796+ and Kronos 2800.[111]

(98) One particular statement made by a customer provides strong confirmation of this point: "there are only four suppliers that offer grades of TiO2 suitable for use in paper laminate, and each offers only one grade (Tronox 8120, Cristal RCL-722, Chemours R796 and Kronos 2800)."[112] Whilst it may be true that Venator's 610L is superior in quality to other sulphate grades, customers did not consider it to be in the same class as the chloride-based paper laminate grades. One explained: "Of the sulphate grades available, the whitest is Venator's R-610 L, but even this does not have the necessary whiteness to be used in laminate paper production […] It is thus not comparable to the chloride laminate paper grades."[113]

(99) The picture is similar for Lomon Billions' sulphate-based paper laminate grade. Lomon Billions itself acknowledges that its sulphate-based grade cannot meet all customers' requirements and that a chloride-based grade, offering better opacity and

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107 Questionnaire 6 to titanium dioxide customers in paper laminate, Q53.4, ID 2556.

108 Reply to SO, paragraphs 133-137.

109 Questionnaire 1 to titanium dioxide customers, Q67; Questionnaire 6 to titanium dioxide customers in paper laminate, Q13, Q14, Q61.1.

110 Questionnaire 6 to titanium dioxide customers in paper laminate, Q13, Q14.

111 Questionnaire 6 to titanium dioxide customers in paper laminate, Q48.

112 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.

113 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.

whiteness, would allow it to widen its potential customer base in paper laminate.[114] It would therefore appear that the grades offered by Venator and Lomon Billions can only be used in very small proportions, blended with chloride paper laminate grades, as is the case for other sulphate grades. As such, they in no way constitute an exception to the general requirement for chloride-based pigment.

(100) An internal report prepared by Cristal following a visit to a customer's production site also demonstrates that […].[115] This clearly indicates that sulphate grades, such as Lomon Billions LR-952, are known not to serve the same purpose as the chloride-based grades in terms of the properties they give to the end product.

(101) This is further confirmed in the material prepared by Cristal for its […].[116] The section of the presentation entitled […].

(102) In view of the results of the market investigation, and other evidence available to it including internal documents from the Parties, the Commission concludes that there is very limited demand-side substitutability between chloride-based and sulphate-based titanium dioxide pigment for use in paper laminate.

(103) Supply-side substitutability between chloride-based and sulphate-based technology is implausible, as the two methods of production are entirely different and require different technology and expertise and different input materials. This is in line with the Commission's previous findings.[117] There is thus no realistic possibility that a sulphate-based producer could start using its production capacity to manufacture chloride-based grades for use in paper laminate. Competitors currently active only in sulphate-based production indicated that moving from sulphate- to chloride-based technology would not be realistic, even if the price of chloride-based pigments were to increase significantly.[118]

(104) This is in line with the Notifying Party's own argument that increasing the capacity of its existing plants would require significant investment.[119] For a supplier not yet active in chloride-based technology, there would be additional hurdles, given that the technology is complex to master and requires many years of experience to operate successfully.[120]

6.2.1.3.3. Conclusion as to the existence of a separate product market for chloride-based titanium dioxide pigment for use in paper laminate

(105) In the light of the results of the market investigation, the arguments presented by the Notifying Party and the other evidence available to the Commission, the Commission concludes that chloride-based titanium dioxide pigment for use in paper laminate constitutes a separate relevant product market.

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114 Response to additional request for information sent to Lomon Billions on 27 February 2018, ID 2503.

115 ID 1957-9907.

116 ID 676-15823.

117 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 85.

118 Questionnaire 2 to titanium dioxide competitors, Q10. One competitor noted, for example, "*we do not think about chloride technology*" (ID 2543), whilst another gave the following explanation as to why starting to produce chloride-based grades would be impossible: "It is very difficult to buy know-how for chloride technology and additionally, the investment cost is so high, that we do not plan to build a chloride plant at all. Moving the sulphate technology to the chloride one is impossible." (ID 2544).

119 Parties' submission of 7 March 2018, "Merger synergies will likely benefit EEA customers", p. 11.

120 Questionnaire 2 to titanium dioxide competitors, Q10, Q26, Q29.1. Minutes of call with technical expert, 22 January 2018, 15.00, ID 2474.

6.2.1.4. Segmentation of titanium dioxide pigment used in mass applications can be left open

(106) The Commission has considered whether grades produced for different end-uses within mass applications belong to the same or to different product markets, and also whether it would be appropriate to distinguish separate markets on the basis of production process (differentiating between chloride-based and sulphate-based titanium dioxide pigment).

6.2.1.4.1. The Notifying Parties' view

(107) The Notifying Party submits that there is one single relevant product market containing all types of grades used in coatings, plastics and paper on the basis of the following arguments: (i) prices in each of the three segments are very similar and move in parallel, thus suggesting that the three segments belong to the same market[121], and (ii) while the Notifying Party agrees that demand-side substitutability may be limited due to customer preferences, it maintains that suppliers can easily switch between the production of coatings, plastics and paper grades.[122]

(108) In the Notifying Party's view, it is also not appropriate to define separate markets for chloride- and sulphate-based titanium dioxide pigment,[123] as (i) there are no significant differences in the quality of specific sulphate and chloride grades, and they can be used interchangeably in most applications,[124] (ii) the prices of chloride- and sulphate-based grades tend to move in parallel, even though changes in the average variable input costs for chloride and sulphate plants respectively are not correlated,[125] and (iii) while the Notifying Party acknowledges that sulphate-based rutile titanium dioxide pigment can have a slightly yellowish colour, it maintains that end users can easily overcome this difficulty (e.g. by adding blue toners) in applications where whiteness is of importance.[126]

6.2.1.4.2. The Commission's assessment

(109) The Commission considers, in line with its previous Decisions (see Section 6.2.1.1.), that plastics and coatings can be regarded as 'mass applications'. As discussed in Section 6.2.1.3., the Commission considers that titanium dioxide pigment used in paper laminate does not belong to the same product market as pigment used for plastic and coating applications.[127] In the remainder of this Decision, the term "mass applications" is therefore used to refer to plastic and coatings applications only.

(110) The results of the market investigation show that at least some customers active in mass applications have more scope for using grades primarily targeted at *other* end-applications (within mass applications) than do customers active in speciality applications. First, some grades for use in mass applications are marketed as multi-purpose grades, meaning that they are suitable for use in both plastic and coating

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121 See also above, Section 6.2.1.3.2.

122 Reply to SO, paragraph 165.

123 Reply to SO, paragraph 166.

124 The Notifying Party further explains that the majority of Tronox's (chloride) grades are equivalent to at least one sulphate grade. For instance, in its view, […] chloride grades compete with […] sulphate grades in coatings. The Notifying Party also considers that […] and that this sulphate grade competes with […] chloride grades in plastic applications.

125 The Notifying Party claims that this demonstrates that the price correlation cannot be attributed to common costs and that it rather suggests that chloride-based and sulphate-based titanium dioxide pigment compete closely with one another.

126 Response to the Decision opening proceedings, paragraph 38.

127 It should be noted that the Transaction does not lead to overlaps in relation to coated paper and only *de minimis* overlaps in fine paper applications (Tronox's market share is limited to [0-5]% in the EEA).

applications (e.g. Tronox's CR-826[128] and CR-828, and Cristal's 595[129]) and have […] sales to both coatings and plastics customers. Second, some respondents indicated that they do not only consider grades targeted at their own industry[130] as "[b]efore purchasing larger quantites [sic], extensive tests are made. Hence there's no restriction"[131] and the "suitability [of a specific grade] for our purposes is determined by other parameters [than the positioning of a grade by the supplier]".[132]

(111) Nonetheless, there are also indications that separate markets may exist for titanium dioxide pigment used in different end-applications as a large proportion of respondents to the market investigation, active in both plastics and coatings, stated that they would only consider using grades of titanium dioxide pigment that are targeted at their industry.[133] Some respondents to the market investigation also explained that the grades designed for use in a particular area offer properties that other grades may not have.[134] One customer explained, for example, that "plastic grades contain specific organic coatings for dispersion purposes".[135]

(112) The results of the Commission's investigation are therefore not fully conclusive. While there are indications that there is more likely to be some element of demand-side substitutability within mass applications than in other areas, the existence of separate markets can also not be fully excluded. In any case, for the purposes of this Decision, the market definition for titanium dioxide pigment for use in mass applications can be left open as the competitive assessment would not change, whether there were considered to be one market for pigment used in mass applications or two separate markets, one for pigment used in coating applications and one for pigment used in plastic applications (see Section 6.3.2).

(113) The same applies to narrower segments that could be identified within plastic and coating applications. In previous cases, the Commission considered potential sub-segments of titanium dioxide pigment for use in coatings (namely architectural, industrial and thin-film coatings) and plastic applications (namely polyolefin, engineering plastics and PVC)[136] but left the precise market definition open. For the purposes of the assessment of the Transaction, this question can also be left open as it would not change the outcome of the competitive assessment (see Section 6.3.2).

(114) The Commission also considered whether, within mass applications, it would be appropriate to distinguish separate markets for titanium dioxide pigment on the basis of the production process (chloride vs. sulphate).

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128 The technical data sheet for Tronox's CR-826 describes it as "a universal product" and "an excellent choice for both coatings and plastic applications".

129 The technical data sheet for Cristal's TiONA 595 describes it as "a high performance, multipurpose chloride-process rutile titanium dioxide pigment designed to give an outstanding combination of dispersion, opacity, gloss and durability".

130 Questionnaire 8 to titanium dioxide customers in plastic, Q7, Q31, Questionnaire 7 to titanium dioxide customers in coatings, Q7.

131 Questionnaire 7 to titanium dioxide customers in coatings, Q7.1.

132 Questionnaire 8 to titanium dioxide customers in plastics, Q7.1.

133 Questionnaire 1 to titanium dioxide customers, Q16, Questionnaire 7 to titanium dioxide customers in coatings, Q7, Questionnaire 8 to titanium dioxide customers in plastics, Q7.

134 One explained, for example, that, "the TiO2-types are designed for certain applications and can hardly be exchanged". Questionnaire 1 to titanium dioxide customers, Q16, ID 2523.

135 Questionnaire 1 to titanium dioxide customers, Q16.

136 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraph 487.
Commission Decision Case M.984 – *DuPont / ICI*, 2 October 1997, paragraph 24.

(115) In previous Decisions, the Commission considered that titanium dioxide pigment used in mass applications produced via the sulphate-based process and titanium dioxide pigment used in mass applications produced via the chloride-based process could be used almost interchangeably, but ultimately left the precise market definition open.[137]

(116) The results of the market investigation in this case indicate that the extent to which customers are willing to switch between sulphate-based and chloride-based titanium dioxide pigment grades may depend on the quality or specific use of the end product. Nonetheless, a majority of customers (active in both plastics and coatings) indicated that they are able to switch at least some of their purchases between chloride- and sulphate-based pigments.[138] The exact proportion of their current purchases of chloride-based grades that could be replaced by sulphate-based grades varied somewhat between customers, but many could use sulphate-based grades in place of at least some and occasionally all of their current purchases of chloride-based grades.[139] One respondent active in coatings clearly stated that there is "no problem to substitute chloride with sulphate".[140] Another respondent reported that "up to 100 %" of chloride based grades used in coatings could be substituted with sulphate based grades.[141]

(117) It is consistent with this evidence that, when asked how they would react if prices of chloride-based grades were to increase, the majority of respondents replied that they could switch some or even all of their current purchases to sulphate-based grades,[142] with many explicitly naming specific grades they know they could use.[143]

(118) The Commission therefore concludes that chloride- and sulphate-based grades of titanium dioxide pigment in rutile form for use in mass applications (defined as plastics and coatings) belong to one and the same product market. However, as explained in recitals (110) to (114), the question whether separate narrower markets can be defined by end-application (within mass applications) can be left open as the outcome of the competitive assessment is the same either way.

6.2.2. Geographic market definition

6.2.2.1. EEA-wide market for chloride-based titanium dioxide pigment for use in paper laminate

6.2.2.1.1. The Notifying Party's view

(119) The Notifying Party submits that the market for titanium dioxide pigment is worldwide in scope, irrespective of how the product market is defined with relation to specific applications within coatings, plastics and paper. The Notifying Party pointed, in particular, to the fact that (i) there are significant global trade flows of

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137 Commission Decision Case M.7061 – *Huntsman Corporation / Equity interests held by Rockwood Holdings*, 10 September 2014, paragraphs 494 and 498.

138 Questionnaire 1 to titanium dioxide customers, Q6, Q7, Questionnaire 7 to titanium dioxide customers in coatings, Q4, Q5, Questionnaire 8 to titanium dioxide customers in plastics, Q4, Q5.

139 Questionnaire 8 to titanium dioxide customers in plastics, Q5, Q19.

140 Questionnaire 8 to titanium dioxide customers in plastics, Q5.

141 Questionnaire 8 to titanium dioxide customers in plastics, Q5.

142 Questionnaire 7 to titanium dioxide customers in coatings, Q28, Questionnaire 8 to titanium dioxide customers in plastics, Q26.

143 Questionnaire 7 to titanium dioxide customers in coatings, Q28.1.

titanium dioxide pigment, and (ii) transport costs and tariffs are not a significant barrier to international trade.[144]

6.2.2.1.2. The Commission's assessment

(120) For the purposes of the assessment of the Transaction, the Commission concludes that the geographic market for chloride-based titanium dioxide pigment for use in paper laminate is EEA-wide.

(121) First, demand for chloride-based titanium dioxide pigment for use in paper laminate is mainly concentrated in the EEA and China. There are only minimal sales for this end-application in other regions.

(122) As can be seen from the chart in Figure 1, Cristal estimated in its internal market intelligence that sales in Europe account for [50-60]% of global demand ([…] kt in 2016)[145] for titanium dioxide pigment for use in paper laminate, when considering both chloride- and sulphate-based grades. Based on information provided by the Notifying Party, it can be estimated that […] over half of this overall global demand is for chloride-based products ([…] kt in 2016).[146] It therefore appears that European sales ([…] kt in 2016)[147] accounted for [50-60]% of global demand for chloride-based grades in 2016.

(123) There are only a small number of other countries worldwide where titanium dioxide pigment is used in the manufacture of paper laminate. In particular, there is very little demand for titanium dioxide pigment grades for paper laminate in North America, one of the major markets for titanium dioxide pigment for use in other end applications. This conclusion is also valid when restricted to chloride-based paper laminate pigment. The demand from the other regions apart from Europe and China included in Cristal's market data (North America, Russia, Japan and Brazil) would together account for a maximum of [10-20]%,[148] on the most conservative assumption that all demand from those countries were for chloride-based products.[149] This is, however, highly unlikely and the proportion is therefore very likely to be lower.

(124) China is thus the only other country where there is significant paper laminate production, and accounts for the remaining [30-50]% of global demand for chloride-based titanium dioxide pigment.

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144 Reply to SO, paragraphs 183-202.

145 Form CO, Table 98.

146 Based on Table 98 of the Form CO and Annex 1 to the Parties' submission of 5 December 2017, it can be deduced that, in 2016, global demand for titanium dioxide pigment for use in paper laminate was […] kt since Chemours' global sales of […] kt are estimated by the Parties to represent [40-50]% of the global chloride-based market. Compared to the overall global market size of […] kt, global demand for chloride-based grades represented [50-60]% of overall demand in 2016. Similarly, in 2013, the equivalent proportion was [40-50]%.

147 Form CO, Annex 6.2-14.

148 Even under the most conservative approach and assuming that all demand in North America, Russia and Japan is chloride-based, these geographic regions would each account for less than [0-10]% of the global demand for chloride-based products (i.e. less than […] kt each). Similarly, the Brazilian market would, under the most conservative approach, account for less than [0-10]% of the global chloride-based demand.

149 Indeed, based on information provided by the Notifying Party, it can be estimated that, in 2016, global demand for chloride-based products represented […] kt.

Figure 1 – Global demand for (chloride- and sulphate-based) titanium dioxide pigment for use in paper laminate in 2013

[…]

Source: […] (Doc ID 588-19617)

(125) Second, data provided by the Parties suggest that there is little trade flow between the EEA and the Chinese markets for chloride-based titanium dioxide pigment for use in paper laminate. Chloride-based grades for use in paper laminate sold in the EEA are either produced in the EEA (by Tronox, Cristal and Kronos) or imported from Mexico[150] (by Chemours).

(126) Both Tronox and Cristal produce chloride-based titanium dioxide pigment […] in their EEA facilities. On average over the period 2014-2017, only a small proportion of the Parties' output was sold in China ([…]% for Cristal and […]% for Tronox), while the vast majority remained in the EEA ([…]% for Cristal and […]% for Tronox).

(127) Kronos produces its chloride-based titanium dioxide grade for use in paper laminate in the EEA and does not therefore account for major imports into the EEA.

(128) Chemours, who produced almost half of the global chloride-based titanium dioxide pigment for use in paper laminate in 2016 accounts for the vast majority of the global trade flows for this product. It produces its chloride-based paper laminate grade exclusively in Mexico, where there is almost no production of paper laminate (and thus no demand for titanium dioxide pigment for this specific use). Imports from Mexico are therefore an exceptional case and cannot support a view that Mexico itself should be part of the same market. The exceptional nature of this specific trade flow is further supported by the fact that imports from Mexico to the EEA are not subject to import duties as opposed to imports from other regions.[151]

(129) Cristal's market intelligence database[152] further confirms that [imports from China are very limited][153] […].

(130) There would therefore appear to be no significant trade flows in chloride-based titanium dioxide pigment for use in paper laminate between the two major regions where paper laminate is produced, the EEA and China.

(131) Whilst the Notifying Party claims in the Reply to the SO that sulphate-based grades for use in paper laminate produced by Chinese suppliers are sold in the EEA, this is irrelevant for the assessment of the current case as these do not form part of the product market under consideration.[154]

(132) Brazil is the third-largest paper-laminate producing region, accounting for up to [0-10]% of demand for chloride-based titanium dioxide pigment for use in paper laminate under the most conservative assumption. There are, however, no exports of chloride-based titanium dioxide pigment from Brazil to the EEA for use in paper laminate, as there is no installed chloride production capacity in Brazil. Exports of chloride-based titanium dioxide pigment from the EEA to Brazil are also very

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150 According to Cristal's internal market intelligence provided in Annex 25-1 to the Parties' reply to RFI11.

151 Contrary to all other imports into the EEA (including those from China), which are subject to a 6% tariff (according to paragraph 317 of the Form CO).

152 Annex 6 to the Parties' Reply to RFI13.

153 Annex 25-1 to the Parties' reply to RFI11.

154 Reply to SO, paragraphs 174-176.

unlikely given the proximity of the market leader (Chemours in Mexico). This is confirmed by the Parties' own sales figures as, over the period 2014-2017, Tronox […] in Central and South America while Cristal realised […] of its RCL-722 in this region (less than […]%).

(133) Third, customers active in the production of paper laminate that responded to the market investigation unanimously stated that sourcing from Chinese suppliers would involve additional costs and challenges.[155] They mentioned transport and related costs, import duties[156] and longer lead times as amongst the main additional difficulties associated with sourcing from Chinese suppliers.[157] The frequency of deliveries was also important to a significant proportion of respondents.[158] These criteria are all closely related to the location of a supplier's plants, thus explaining customers' preference for suppliers based in the EEA or with good transport and distribution links.

(134) The vast majority of customers active in the production of paper laminate that responded to the market investigation stated that they are aware of the location of the plant at which the titanium dioxide they purchase is produced, and that this is an important factor in their choice of supplier.[159] One customer explained, for example: "Certainly it is preferable to buy TiO2 from stable countries with simple logistics".[160]

(135) Therefore, the evidence presented in the preceding two recitals also demonstrates that the additional claims made by the Notifying Party in its Reply to the SO, namely that lead times are no longer for suppliers located outside the EEA and that the location of suppliers is not important,[161] are unfounded.

(136) In the light of the results of the market investigation and of the other information and evidence available to it, the Commission considers that, for the purposes of the assessment of the Transaction, the relevant geographic market for chloride-based titanium dioxide pigment for use in paper laminate is EEA-wide in scope.

6.2.2.2. EEA-wide market for titanium dioxide pigment used in mass applications

6.2.2.2.1. The Notifying Party's view

(137) The Notifying Party submits that the market for titanium dioxide pigment is worldwide in scope, irrespective of how the product market is defined. Therefore, the same arguments apply in relation to paper laminate end-use as to mass applications (see Section 6.2.2.1.1).

6.2.2.2.2. The Commission's assessment

(138) On the basis of its market investigation and the other evidence available to it, the Commission concludes that the various possible markets for titanium dioxide pigment for use in coatings and plastics (and their various possible sub-segments) are EEA-wide.

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155 Questionnaire 6 to titanium dioxide customers in paper laminate, Q43.

156 Import duties of 6% are levied on imports of titanium dioxide pigment originating from any location except Mexico, for which import tariffs are 0% (according to paragraph 317 of Form CO). As a result, Chemours benefits from 0% duties for imports to the EEA of its paper laminate grade, whereas any other supplier exporting from another region would be subject to 6% duties.

157 Questionnaire 6 to titanium dioxide customers in paper laminate, Q43.1.

158 Questionnaire 6 to titanium dioxide customers in paper laminate, Q39.

159 Questionnaire 6 to titanium dioxide customers in paper laminate, Q38.

160 Questionnaire 6 to titanium dioxide customers in paper laminate, Q38, ID 1692.

161 Reply to SO, paragraphs 177-182.

(139) First, the results of the market investigation support the conclusion that transport costs[162] and import duties[163] are not insignificant and tend to limit the extent to which customers are willing to source from suppliers located outside the EEA. A number of customers also cited long lead times as a factor that would make sourcing titanium dioxide pigment from a long distance uneconomical or undesirable.[164]

(140) Second, Chemours is responsible for most of the imports to the EEA and Chemours sells significant volumes of titanium dioxide from its plant in Mexico in the EEA. It is the only major producer exporting to the EEA from Mexico, and has the advantage for these imports of 0% duties, whilst all other imports (including those from the United States and China) are subject to a 6% tariff.[165]

(141) Third, the Notifying Party pointed to the recent increase in imports from China as an indication of the constraint placed on it by Chinese suppliers. However, the Commission notes that the increase in imports observed in 2017 is largely attributable to the closure of Venator's Pori plant in January 2017 which caused a shortage of EEA-based production. Despite the increase in exports from China to the EEA, prices in Europe rose significantly in the course of 2017 relative to those in China, thus suggesting that imports have not been sufficient to offset the upward pressure on prices caused by Pori's closure.

(142) Fourth, customers with production facilities in multiple regions indicated that they often negotiate contracts and prices separately for each region.[166] This is consistent with internal documents of the Parties depicting price negotiations with multi-national companies, which show […].[167] This is also in line with the competitors' response to the market investigation where they reported there to be meaningful differences in the competitive conditions encountered in the EEA and in other regions.[168]

(143) The Commission therefore considers that, for the purposes of the assessment of the Transaction, the relevant geographic market for rutile titanium dioxide pigment for use in mass applications, and any possible sub-segments thereof, is EEA-wide in scope.

6.3. Competitive assessment

(144) Article 2 of the Merger Regulation requires the Commission to examine whether notified concentrations are to be declared to be compatible with internal market by assessing whether they would significantly impede effective competition in the internal market or in a substantial part of it.

(145) The Commission Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings[169] (the

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162 Minutes of call with titanium dioxide customer, 29 June 2017, 14.30, ID 2480.

163 Questionnaire 1 to titanium dioxide customers, Q34.

164 Questionnaire 1 to titanium dioxide customers, Q36.

165 Form CO, paragraph 317.

166 Questionnaire 1 to titanium dioxide customers, Q42.

167 For instance, in an e-mail of July 2015 Cristal makes the following offer to [customer]: "we propose you the following: From Aug 1 till October 31, 2015 the TiONA 595/128 […]" (ID 589-33959) Tronox has a similar approach towards [customer]: "I propose the following […]" (ID 674-15502).

168 They mentioned in particular the absence of sulphate-based grades in the United States, the stricter environmental regulations in force in the EEA and the sale of titanium dioxide in slurry form in the United States (which is not generally accepted by EEA customers). Questionnaire 2 to titanium dioxide competitors, Q49.

169 OJ C31, 5.2.2004, p. 5.

"Horizontal Merger Guidelines") distinguish between two main ways in which mergers between actual or potential competitors on the same relevant market may significantly impede effective competition, namely non-coordinated effects and coordinated effects.

(146) Non-coordinated effects may significantly impede effective competition by eliminating the competitive constraint imposed by each merging party on the other, as a result of which the merged entity would have increased market power without resorting to coordinated behaviour. In this regard, the Horizontal Merger Guidelines consider not only the direct loss of competition between the merging firms, but also the reduction in competitive pressure on non-merging firms in the same market that could be brought about by the merger. According to recital (25) of the preamble to the Merger Regulation, a significant impediment to effective competition can result from the anticompetitive effects of a concentration even if the merged entity would not have a dominant position on the market concerned.

(147) The Horizontal Merger Guidelines list a number of factors which may influence whether or not significant non-coordinated effects are likely to result from a merger, such as the large market shares of the merging firms, the fact that the merging firms are close competitors, the limited possibilities for customers to switch suppliers or the fact that the merger would eliminate an important competitive force. Not all of these factors need to be present for significant non-coordinated effects to be likely. The list of factors, each of which is not necessarily decisive in its own right, is also not an exhaustive list.

(148) The Commission carried out an extensive competitive assessment of the Transaction in Phase I in order to assess whether the notified concentration raised serious doubts with regard to its compatibility with the internal market on account of non-coordinated effects in the relevant markets for titanium dioxide pigment. It concluded that the concentration did raise such doubts and it therefore initiated proceedings pursuant to Article 6(1)(c) of the Merger Regulation.

(149) The Commission's further investigation in Phase II has confirmed its conclusion with respect to the EEA market for chloride-based titanium dioxide pigment for use in paper laminate (see Section 6.3.1).

(150) However, based on the full body of evidence collected during Phase II, the Commission has concluded that the concentration would not lead to horizontal non-coordinated effects in the EEA market for coatings and plastics or in any of its plausible sub-markets (see Section 6.3.2).

(151) The Commission also investigated the likelihood of coordinated effects and came to the conclusion that, on balance, while there are some indications of possible coordinated effects, the notified concentration would not significantly impede effective competition due to coordinated behaviour (see Section 6.3.3).

(152) The Commission assessed the claims brought forward by the Notifying Party in relation to possible synergies and came to the conclusion that efficiencies of significant benefit to EEA customers on the markets for titanium dioxide pigment for use in paper laminate have not been sufficiently substantiated (see Section 6.4).

(153) Finally, the Commission also investigated the impact of the concentration on vertical relations, coming to the conclusion that the concentration would not impede effective competition as a result of vertical effects (see Section 7.3.2).

6.3.1. Non-coordinated horizontal effects in the EEA market for chloride-based titanium dioxide pigment for use in paper laminate

6.3.1.1. Introduction

(154) The Commission considers, on the basis of the results of its market investigation and the other information available to it, that the notified concentration would significantly impede effective competition in the EEA on the market for chloride-based titanium dioxide pigment for use in paper laminate as a result of the reduction from four to three in the number of competitors active on that market. The Transaction would eliminate an important competitive constraint and bring together two close competitors on an already highly concentrated market, which is characterised by customers' need to multi-source and by the fact that suppliers' power to increase prices is protected by the difficulty that customers face in switching suppliers and by the high barriers to entry and expansion.

6.3.1.2. Market structure

(155) There are only four titanium dioxide pigment manufacturers active in the EEA that offer chloride-based grades for use in paper laminate in their product portfolios. Each of those manufacturers offers one grade. Tronox's grade, 8120, is produced [in the EEA] and Cristal's grade, RCL-722, is produced [in the EEA].[170]

(156) In addition to the Parties, only Chemours and Kronos offer chloride-based titanium dioxide pigment for use in paper laminate in the EEA.

(157) Table 1 shows the Parties' and their competitors' market shares in the market for chloride-based grades for use in paper laminate in the EEA.

[170] [Information on Parties' limited sales of other grades to customers in the paper laminate segment]

Table 1 - Market shares for chloride-based titanium dioxide pigment for use in paper laminate in the EEA

Chloride-based TiO_2 pigment for use in paper laminate, EEA	Market shares based on volume			Volume		Main grades currently sold in EEA
	2014	2015	2016	2016	2017[171]	
Total market	*100%*	*100%*	*100%*	*[...] kt*	*NA*	
Tronox	[0-5]%	[0-5]%	[5-10]%	[…] kt	[…] kt	8120
Cristal	[30-40]%	[20-30]%	[30-40]%	[…] kt	[…] kt	RCL-722
Combined	[30-40]%	[30-40]%	[30-40]%	[…] kt	[…] kt	
Chemours	[40-50]%	[40-50]%	[40-50]%	[…] kt	[…]	R-796+
Kronos	[20-30]%	[10-20]%	[10-20]%	[…] kt	[…]	2800
Unknown/ unallocated	[0-5]%	[0-5]%	[0-5]%	[…] kt	[…]	

Source: Annex 6.2-14 to the Form CO and Annex 11 to RFI15

(158) Table 1 shows that the merged entity would have a market share of [30-40]% (with an increment of [5-10]% brought by Tronox) on the EEA market for chloride-based grades for use in paper laminate, based on 2016 market shares.

(159) The Notifying Party leaves [0-5]% of the market unattributed (unknown/unallocated). Customers' responses to the Phase I market investigation confirmed, however, that there are no competitors active in this sector beyond the four shown in the market shares (the Parties, Chemours and Kronos). Those four suppliers were consistently named as the only four possible suppliers of chloride-based grades for use in paper laminate, with no others being mentioned.[172] No respondents used, or had even qualified, any other chloride grades for use in paper laminate apart from those offered by the four suppliers listed in Table 1.[173] The unallocated [0-5]% shown in the market shares must therefore be allocated to those four suppliers known to be active on the market.[174]

(160) The Parties were not able to provide market shares or the total size of the market for 2017 and provided only sales figures for the Parties. The Commission was therefore also not able to calculate the Parties' market shares. As can be seen from the sales figures available for that year, it can, however, be noted that Tronox increased its sales of its 8120 grade from […]kt in 2016 to […]kt in 2017 and Cristal reduced its sales from […]kt in 2016 to […]kt in 2017. The increase in Tronox's sales is a clear indication that, as a result of the Transaction, a significant competitive force would be removed from this concentrated market.

6.3.1.3. The Transaction would reduce the number of players on an already concentrated market

6.3.1.3.1. The Notifying Party's view

(161) The Notifying Party claims that the increment in market share resulting from the Transaction is very small and that the Parties would not become the leading player on the market, with Chemours remaining the largest supplier by some distance.[175] Furthermore, the Notifying Party highlights the fact that Chemours has increased its

171 The Notifying Party was unable to provide market shares for its competitors for 2017 or to estimate the total market size.

172 Questionnaire 1 to titanium dioxide customers, Q50.

173 Questionnaire 6 to titanium dioxide customers in paper laminate, Q15.

174 The Parties explain that these [0-5]% cannot be allocated to the Parties, as a result of which they can only be attributed to either Kronos or Chemours, as the Parties seem to acknowledge (Reply to SO, paragraph 219).

175 Reply to SO, paragraph 205.

imports from Mexico to the EEA in 2017 and has announced its intention to expand its titanium dioxide pigment production capacity by 10% by 2021 through de-bottlenecking measures. The Notifying Party claims that part of the increase can be expected to be accounted for by its paper laminate grade.[176]

6.3.1.3.2. The Commission's assessment

(162) The Transaction would further reduce the number of players active on the market from four to three. Post-Transaction, the merged entity and Chemours would become the two main suppliers, holding over [80-90]% of the market between them. The only other competitor with a meaningful market share would be Kronos, with just under [10-20]% (based on 2016 market shares).

(163) Based on 2016 market shares, the Transaction would increase the Herfindahl-Hirschman-Index (HHI) by [0-500] from [3000-4000] to [3000-4000], indicating a significant level of concentration on this market. This is reflected in the fact that the choice of suppliers for customers active in paper laminate production is already very limited, and any further concentration of the market would leave customers with even fewer options.

(164) Internal documents provided by the Parties also suggest that they view the market for titanium dioxide pigment for use in paper laminate as a particularly concentrated segment, and see the potential for exploiting this. In […][177], it was noted that the market for grades for paper laminate […]. Furthermore, it was noted that there were […], suggesting that there is also some level of certainty that the sector will remain concentrated. […].

(165) The Commission also considers that the Notifying Party's observation that Chemours increased its overall imports from Mexico in 2017 (on the basis of figures for the year-to-date from October 2017) is not necessarily relevant for the assessment of chloride-based titanium dioxide pigment for use in paper laminate applications. The Commission considers it more probable that the increase in imports would have been primarily driven by other end-applications that were directly affected by the shortage of sulphate-based grades as a result of the fire at Venator's plant in Finland in January 2017. Furthermore, any further increase in Chemours' sales in this particular market would be highly likely to lead to even higher levels of concentration (in other words, to an HHI level in 2017 higher than that of [3000-4000] recorded for 2016).

6.3.1.4. Closeness of competition

6.3.1.4.1. The Notifying Party's view

(166) The Notifying Party submits that only a small proportion of the Parties' customers in the paper laminate segment are common customers.[178]

(167) The Notifying Party also refutes the claims made by some customers that the Parties have particularly high quality grades.

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176 Reply to SO, paragraph 210.

177 […], ID 588-19617.

178 The Response to the Decision opening proceedings, paragraph 175 ("the Parties have only […] […] [overlapping customers] out of […] for paper laminates"). In its reply to the SO, paragraph 231, the Notifying Party corrects that there are only […] common customers between the Parties, […] and […]. The Notifying Party further notes, in footnote 247 of its reply to the SO, that […] and, in paragraph 232 of its reply to the SO, […].

(168) The Notifying Party dismisses the importance attached by customers to the fact that both Parties have production plants in Europe, noting that Kronos is also present in the EEA and that Chemours has warehouses in the EEA from which it can just as easily serve European customers, as demonstrated by its high market share. In addition, the Notifying Party argues that the Parties' vertical integration is not a similarity, as Cristal is only vertically integrated to a limited extent, and that this is not, in any case, an important consideration when discussing closeness of competition.

(169) In the Reply to the SO, the Notifying Party provided an analysis of Tronox's […] files) over the period 2013-17 and an analysis of Cristal's […] for the period October 2015 to December 2017 in order to illustrate that Tronox and Cristal do not compete particularly closely in relation to paper laminate customers. More specifically, […]. As for Cristal's interactions with paper laminate customers, over the period for which PDFs were readily available Tronox […].[179]

(170) The Notifying Party further provided in its Reply to the SO the Parties' sales volumes in the EEA for paper laminate applications over a longer period of time (2010-2017 for Cristal and 2012-2017 for Tronox) and claimed that when Cristal experienced a supply disruption in 2012, Tronox did not win any additional volumes that year.

(171) Finally, in a technical analysis of paper laminate grades provided with its Reply to the SO[180], the Notifying Party provided additional technical data about several titanium dioxide pigment grades for use in paper laminate in terms of mass tone, brightness, lightfastness and opacity. As far as chloride-based grades are concerned, the Notifying Party claimed that Cristal's RCL-722, Tronox's 8120, Chemours' R-796+ and Kronos' 2800 are all equally close to one another as any differences in terms of colour (mass tone and brightness) are invisible to the human eye.[181]

6.3.1.4.2. The Commission's assessment

(172) In the light of the results of the market investigation and the other information and evidence available to it, the Commission's considers that the four suppliers offering chloride-based titanium dioxide pigment for use in paper laminate in the EEA are close competitors in this market.[182]

(173) Responses to the market investigation from customers active in the production of paper laminate showed that the four main chloride-based grades offered by the Parties, Chemours and Kronos for use in paper laminate are generally perceived as being similar in terms of quality and possible usage. Customers did not report there being any major differences between the four grades. They generally regard the

179 Reply to SO, paragraphs 224-226.

180 Reply to SO, Appendix B.

181 According to the Notifying Party, the threshold of visibility is given by a Delta-E value of 1 unit, where Delta-E value is the measure of the Euclidian distance between two points in the 'Lab' colour space, i.e. the space where colours are measured along the three dimensions of brightness (L* value), red/green balance (a* value, which does not materially vary between grades and is typically not reported on in laboratory tests) and blue/yellow balance (b*, often referred to as masstone). The Notifying Party explains that any Delta-E difference of less than 1 unit is invisible to the human eye (Reply to SO, Appendix B).

182 The Parties' grades may even be seen to be particularly close from a technical perspective, being the best performing chloride-based grades in terms of […] (see figure […]) and […] (see figure […]).

properties of these grades as being fairly similar,[183] and mentioned that they could even sometimes be blended together, depending on the particular product.[184]

(174) That perception is confirmed by the views expressed by customers with regard to possible alternatives to the four grades offered by the Parties, Chemours and Kronos. When asked to identify credible alternatives (both technically and commercially) for the Parties' grades 8120 and RCL-722, no respondents mentioned ISK's CR-85 or CITIC Jinzhou's CR-300[185] (nor any sulphate-based grades for use in paper laminate). While Chemours' grade R-796+ is the grade most often identified as being a credible alternative to Cristal's RCL-722 (all respondents but one), Cristal's grade is most often identified as being a credible alternative to Tronox's 8120. Four out of six respondents (representing 89% of the total EEA market for chloride-based titanium dioxide for use in paper laminate) consider that the Parties' grades are credible alternatives for one another.[186]

(175) Internal documents provided by the Parties confirm that they see the four grades offered by themselves, Kronos and Chemours as the only genuine competing products, and that all four of those grades compete closely against one another. In internal Tronox emails […][187]

(176) Internal emails sent within Cristal also demonstrate that discussions of the paper laminate market are based on the prior assumption that […]. An email sent as part of an internal assessment of market opportunities for […].[188] Although this observation does not relate to the EEA market but to […] further illustrates the closeness of competition between these four products.

(177) The Commission considers that the closeness of competition between those four grades is confirmed by their similar technical properties, which set them apart from other (predominantly sulphate-based) grades that may be marketed for use in paper laminate. An internal document prepared by Cristal assesses […](see Figure 2).[189]

Figure 2 – Comparison of the main titanium dioxide pigment grades used in paper laminate production in terms of mass tone and brightness

[…]

Source: Internal documents, by Cristal 27-28 October 2014 (Doc ID 2061-1671)

(178) In addition to the fact that the four grades indicated in Figure 2 are close competitors, there are also indications confirming specifically that Tronox and Cristal's respective paper laminate grades compete closely with one another.

(179) Figure 2 illustrates that, Tronox's 8120 and Cristal's RCL-722 are […]. This indicates that the Parties' grades are particularly close competitors in this respect. In the Reply to the SO, the Notifying Party argued that lower mass tone values are not necessarily always better from the customer's perspective, quoting Munksjö (who noted in relation to a possible trend in lower b* [i.e. mass tone] "that is a bit concerning, since bluer is perceived **(not objectively)** as less opaque" (emphasis added))[190]. The

183 Questionnaire 6 to titanium dioxide customers in paper laminate, Q16.
184 Questionnaire 6 to titanium dioxide customers in paper laminate, Q16.
185 These two grades are both chloride-based and designed for use in paper laminate but, as confirmed by customers' lack of awareness of them, are not sold on the EEA market.
186 Questionnaire 6 to titanium dioxide customers in paper laminate, Q48.
187 ID 674-1877. […].
188 ID 588-66663.
189 […].
190 Reply to SO, paragraph 227.

Notifying Party also argued that differences between grades become invisible to the human eye as soon as the Delta-E* value is lower than 1.[191] However, the Notifying Party does not manage to refute the fact, based on the chart in Figure 2, that Tronox's 8120 and Cristal's RCL-722 have […].

(180) Whether or not differences in colour between Cristal's RCL-722, Tronox's 8120, Chemours' R-796+ and Kronos' 2800 are invisible to the human eye before any extended exposure to light, the Parties' grades are, […]. Lightfastness is a measure of colour durability or 'light stability' and is a particularly important property for paper laminate customers, alongside colour and opacity.

(181) In the Reply to the SO, the Notifying Party provided an additional technical chart prepared by Cristal comparing lightfastness for several titanium dioxide grades for use in paper laminate (see Figure 3).

Figure 3 – Cristal comparison of suppliers' grades' lightfastness after 300 hours in a white paper laminate

[…]

Source: Figure 3 in Appendix B to the Reply to the SO

(182) As can be seen in Figure 3, after 300 hours in a white paper laminate, the differences in Delta-E for Kronos' 2800 and Chemours' R-796 […] are above (approximately) […], while the Parties' grades tended to deteriorate by […]. These results indicate that, even though differences in colour between the four chloride-based grades may be small and invisible to the human eye, visible differences in colour appear after an extended exposure to UV light. In particular, Tronox's and Cristal's grades appear to perform […] than those of Chemours and Kronos.[192]

(183) The Parties also have a very high proportion of shared customers. Whilst the Notifying Party claims that only a small proportion of the Parties' customers in the paper laminate segment are common customers,[193] the Commission considers this a misleading interpretation of the data. The common customers are particularly large and therefore account for the vast majority of the Parties' sales. Cristal's sales to customers that also purchase from Tronox represent […]% of Cristal's total sales within this segment. Similarly, Tronox's sales to customers that are also customers of Cristal represent […]% of Tronox's total sales within this segment. It should be noted in particular that […] customers are […]common customers.[194] [195] The Notifying Party's observation therefore does not demonstrate that the Parties are not close competitors.

(184) While there may be some technical differences between the four chloride grades (RCL-722, 8120, 2800 and R796+), they all offer a very similar, high level of performance – far superior to that of any other grades that may be used in paper laminate (in other words, sulphate grades).[196]

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191 Reply to SO, paragraph 228.

192 […].

193 The Response to the Decision opening proceedings, paragraph 175 ("the Parties have only […][…] [overlapping customers] out of […] for paper laminates").

194 Annex 20 to the Notifying Party's response to RFI11.

195 The Notifying Party claims that Tronox did not win any additional volumes in 2012 when Cristal experienced a supply disruption and this indicates that the Parties are not close competitors. However, this argument is unsubstantiated as Tronox's sales prior to 2012 were not provided. According to the Notifying Party, no sales data is available for Tronox prior to 2012 (Reply to the SO, paragraph 238).

196 […].

(185) In conclusion, on the basis of the available evidence and in the light of the results of the market investigation, the Commission considers Tronox and Cristal to be close competitors on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate.

6.3.1.5. Tronox is an important competitive force

6.3.1.5.1. The Notifying Party's view

(186) The Notifying Party submits that it is a small player in the EEA and emphasises that it has only one production facility in this region. The Notifying Party claims that the increment created by the Transaction on the market for chloride-based titanium dioxide pigment for use in paper laminate is very small, as Tronox had a market share of only [5-10]% on this market in 2016.

(187) On the basis of Tronox's supposedly minor presence on the market for chloride-based titanium dioxide pigment for use in paper laminate, and the overall position that the merged entity would have on this market (which, according to the Notifying Party, would remain modest compared to that of Chemours), the Notifying Party comes to the conclusion that the Transaction would not remove an important competitive constraint.

6.3.1.5.2. The Commission's assessment

(188) The Commission's view is that Tronox, despite being the smallest of the four suppliers active on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, is nonetheless an important competitive force and the removal of either Tronox or Cristal would significantly reduce competitive pressure on that market.

(189) First, the Transaction would combine two out of only four suppliers offering chloride-based grades for paper laminate in the EEA. In the particular context of a four-to-three consolidation in this market, Tronox's relatively modest market share in 2016 ([5-10]%) should not be interpreted as an indication that it does not have sufficient strength to act as a significant competitive force vis-à-vis its three current rivals.

(190) Second, as can be seen in Table 1, Tronox's sales to customers active in the production of paper laminate […].[197] This significant increase in sales demonstrates that Tronox is a credible competitor on this market, offers a comparable product to that of the other three suppliers,[198] and is able to win sales from the other three suppliers and, as such, exerts effective competitive pressure on the market.

(191) It should also be noted that Tronox's increase in sales in 2017 largely occurred at the expense of Cristal, whose sales fell by […] during the same period.[199] The Notifying Party explained that the fall in Cristal's sales in 2017 can be attributed to […]. It also submitted that Tronox […]. The Parties' sales databases reveal, however, that […] sales lost by Cristal went […] partially to Tronox. […].

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197 An increase of […] kt, from […] kt (2016) to […] kt (2017), representing an increase of […]%.

198 This is evidenced by references made in Tronox's internal documents to customer satisfaction levels: […], Internal document, ID 674-1879.

199 A decrease of […] kt, from […] kt (2016) to […] kt (2017), representing a decrease of […]%.

(192) That example demonstrates Tronox's ability to compete successfully for major customers and to win business from the other suppliers, including in particular Cristal. It is also noted that Tronox […][200][…].

(193) Further evidence from Cristal's internal documents also suggests that the Parties compete strongly on other major client accounts, including […]. An internal email sent between Cristal staff contained the following statement: […][201] This clearly indicates that Tronox's pricing influences the price that Cristal is able to negotiate and that, as such, Tronox acts as an important competitive constraint on Cristal.

(194) More generally, it is noted that Tronox's market share had increased year-on-year over the period 2015-2017. Although Tronox's market share fell slightly between 2013 and 2015, considering the whole period 2013-2017, its sales increased by […]% in absolute terms and […]% as a proportion of the total market. Tronox's status as a major competitor on this market is also confirmed by the statement made in its 2016 […] to the effect that Tronox has a "strong presence in paper laminate".[202]

(195) Third, despite having the lowest production levels among the four suppliers, Tronox has the technical ability to supply up to at least […]%[203] of the total EEA market for chloride-based titanium dioxide pigment for use in paper laminate and it is therefore a credible supplier, even vis-à-vis the largest customers. [Statements made by Tronox to a paper laminate customer regarding its production capacity, suggesting that Tronox has the ability and intention to compete fiercely on this market][204][…],[205][…],[206][…].

(196) Fourth, internal documents reveal that [Information on Tronox' production capabilities in the area of paper laminate],[207][…].

(197) [Information on Tronox' production capabilities].[208]

(198) Internal documents produced by Tronox indicate that [Information on Tronox' business plan][209],[…].

(199) In the Reply to the SO, the Notifying Party declared that [Information on Tronox' business plan].[210]

(200) […]. Tronox publicly announced its intention to acquire Cristal in February 2017, and it is therefore likely that discussions on the Transaction were already underway when […].

(201) Fifth, Tronox exerts an important competitive constraint on its competitors in the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, even on customer accounts that it does not currently supply. Tronox currently serves […] largest EEA customers in the paper laminate market. It is clear from the

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200 Less than […] kt in aggregate over the 2013-2015 period.

201 ID 588-10891.

202 ID 2041-1777.

203 This can be seen as a conservative estimate as it accounts for the volumes […].

204 ID 674-17029. The document's instruction mention that […].

205 […] tonnes out of a total of […] tonnes.

206 The Notifying Party provided data on production volumes on specific lines for the first four months of 2017 only. It is not therefore possible to conduct a more comprehensive analysis of the difference in production patterns between these two years.

207 ID 2041-1777.

208 ID 674-1879.

209 ID 674-16361.

210 ID 674-18347.

responses of other customers that they also consider Tronox a credible supplier and rate its paper laminate grade as highly as that of its competitors. One customer that does not currently source from Tronox nonetheless stated that "the four chloride laminate paper grades are all very similar and can all be used in production of the same types of laminate paper"[211] and emphasised that it was no less concerned about the Transaction despite the fact that it did not source from Tronox at present. Another customer for which Tronox is not a current supplier also indicated in its response that (i) Tronox is a competitive alternative[212] for it; (ii) Tronox and Cristal's grades are credible alternatives to one another[213] and Tronox is a credible supplier for paper laminate production[214]; and (iii) the quality of Tronox's products is good[215]. That same customer is particularly concerned by the prospect of the Transaction as it expects prices to rise and finding volumes to become more difficult. When asked about the impact of the Transaction, it commented: "Pls b[e] very critical into this acquisition. This will have a very high negative Impact on our competitiveness for international and European customers".[216]

(202) More generally, all but one customer that replied to the market investigation considered Tronox to be a credible supplier for paper laminate production.[217] Moreover, given the current lack of availability of volume on the market, the fact that a particular customer does not source from a particular supplier should not necessarily be interpreted as a choice not to do so, or as any reflection on the suitability of the supplier *per se*.

(203) More specifically, internal documents show that Tronox is perceived by Cristal as a threat […]. In an internal email exchange between members of Cristal staff, […][218]. This clearly indicates, first, that Cristal is aware that this customer would consider sourcing from Tronox and, second, that the risk of this happening could have an influence on how Cristal negotiates with the customer.

(204) In the particular case of [customer], internal Tronox documents appear to confirm Cristal's view. […][219][…][220]

(205) However, it is clear that […][221]

(206) In conclusion, on the basis of the evidence available to it and in the light of the results of the market investigation, the Commission considers that removal of one of the only four suppliers offering chloride-based titanium dioxide pigment grades in the EEA for use in paper laminate would lead to the elimination of a significant competitive constraint on the remaining three suppliers. Although Tronox's market share was fairly modest in 2016, there are strong indications, including in particular the business won in 2017 and […], that Tronox exerts effective competitive pressure on its competitors.

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211 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.
212 Questionnaire 6 to titanium dioxide customers in paper laminate, Q41.
213 Questionnaire 6 to titanium dioxide customers in paper laminate, Q48.
214 Questionnaire 6 to titanium dioxide customers in paper laminate, Q51.
215 Questionnaire 6 to titanium dioxide customers in paper laminate, Q50.
216 Questionnaire 6 to titanium dioxide customers in paper laminate, Q77.
217 Questionnaire 6 to titanium dioxide customers in paper laminate, Q51.
218 ID 645-13613.
219 ID 674-1877.
220 ID 643-8575.
221 ID 625-1216.

6.3.1.6. Difficulty of switching between grades and between suppliers

6.3.1.6.1. The Notifying Party's view

(207) The Notifying Party claims that customers have usually qualified grades from a number of suppliers and can therefore switch easily between these grades. The Notifying Party acknowledges that some changes may need to be made to a particular product formulation to accommodate differences between grades, but argues that customers are familiar with this process and it is not so expensive as to deter customers from switching grades if a particular supplier increases its prices.

(208) The Notifying Party presented data from the Parties' sales which it claims illustrate that there is significant adjusting of volumes between suppliers. According to the Notifying Party, customers can reduce their allocation to a particular supplier without stopping using that supplier entirely and, as such, they can bring pressure to bear if they are unwilling to accept a price rise.

6.3.1.6.2. The Commission's assessment

(209) Responses to the market investigation confirmed that it is generally difficult for customers active in the production of paper laminate to switch from a particular supplier, particularly in cases where an alternative grade has not yet been qualified as an input in a specific formulation. Customers generally regard the need to approve suppliers and individual grades as a significant barrier to switching.

(210) The vast majority of customers active in paper laminate production confirmed that they would need to approve a particular supplier before being able to start sourcing from them. Customers explained that the approval process involves extensive testing of the individual grades, usually starting with tests in a laboratory setting, in order to evaluate critical characteristics of the new grade, before moving on to larger scale tests on the production line.[222] Customers reported that qualifying a new grade would typically take between six and eighteen months.[223] In practice, none of the respondents had qualified any new chloride-based grades during the last three years,[224] and they explained that they typically tried to avoid changing grades so as to avoid the changes to the formulation that this would require.[225] The need to qualify grades in this way means that customers cannot change immediately from one grade to that of a competitor, even if both are indicated as being for the same area of use. Changing suppliers would need to be planned sufficient time in advance in order to allow appropriate testing and validation to be undertaken.

(211) In the Reply to the SO, the Notifying Party provided estimates, for each of Tronox and Cristal, of customer churn related to their sales of chloride-based paper laminate grades over the period 2012-17. In its methodology, the Notifying Party considered there to be customer churn in all cases where sales to a specific customer increased or decreased by more than 30% compared with the previous year. The Commission considers that this methodology does not provide a reliable reflection of volume churn. First, the methodology relies on an arbitrary threshold set by the Notifying Party and not supported by any further assessment. Second, the methodology does not take into account variation in a customer's total demand and, as such, incorrectly assumes that increases in sales are indicative of the customer moving business from a

222 Questionnaire 1 to titanium dioxide customers, Q71-72.
223 Questionnaire 6 to titanium dioxide customers in paper laminate, Q66.3.
224 Questionnaire 6 to titanium dioxide customers in paper laminate, Q66.
225 Questionnaire 6 to titanium dioxide customers in paper laminate, Q71.

competitor and reductions in sales are indicative of business being lost to a competitor. That is not necessarily the case. The customer's own growth should also be taken into account and may, in some cases, explain the increase in purchases from a particular supplier.[226]

(212) The Commission has therefore reached the conclusion that it is very difficult, and not particularly common, for customers active in the production of paper laminate to switch suppliers, and that the time and investment that switching requires places customers in a weaker negotiating position. As a consequence, the merged entity would have greater power to increase prices.

6.3.1.7. Barriers to expansion

6.3.1.7.1. The Notifying Party's view

(213) The Notifying Party submits that the possibility of capacity expansion constitutes an effective competitive constraint on the Parties, as any attempt to increase prices would attract an increase in supply from competitors.

(214) The Notifying Party claimed in the Reply to the SO that switching between paper laminate and other grades is not costly or time-consuming, and that Kronos and Chemours could easily increase their production of paper laminate grades in response to a price increase.[227]

6.3.1.7.2. The Commission's assessment

(215) Merging firms may have an incentive to reduce output below the combined pre-merger levels, thereby raising market prices, especially when competitors of the merging firms are unlikely to increase their supply substantially if prices increase.[228] Output expansion is unlikely when competitors face binding capacity constraints and the expansion of capacity is costly.[229] This is one of the factors cited in the Horizontal Merger Guidelines as being able to influence whether a merger is likely to lead to non-coordinated effects.[230]

(216) The Commission's decision in Case M.6471 *Outokumpu/INOXUM* found that, even when there is some spare capacity in a market, a merger that leads to a significant consolidation of capacity can be expected to lead to non-coordinated effects.[231]

(217) The Commission has considered whether, in the case of the Transaction, the Parties' competitors would have sufficient spare capacity to expand production of their paper laminate grades or whether they would have incentives to shift production capacity from other grades to paper laminate grades. The Commission has come to the conclusion that capacity expansion by the existing competitors in the EEA market for

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226 For example, internal market intelligence gathered by Cristal (provided as underlying data to a chart presented in slide 14 of ID676-15823) shows that, between 2012 and 2013, Cristal increased its sales to […] from […]kt to […]kt ([…]% increase), but also that in the same period […] increased its overall purchases from […]kt to […]kt.

227 Reply to SO, paragraphs 101-103.

228 Horizontal Merger Guidelines, paragraph 32.

229 Horizontal Merger Guidelines, paragraph 34.

230 Horizontal Merger Guidelines, paragraphs 24-38.

231 Commission Decision in Case M.6471 – *Outokumpu/INOXUM*, 7 November 2012, paragraphs 395-402. It was noted in this case that "even if firms in the industry have a degree of spare capacity as in the present case, the merged entity will still face significantly less rival capacity and less rival spare capacity post-merger than each of the merging firms is facing pre-merger" and thus that "the consolidation of levels of capacities as encountered in the present case through a merger will, in general, increase the market power of the merged entity" (paragraph 399).

chloride-based titanium dioxide pigment for use in paper laminate is unlikely to prevent non-coordinated effects from arising.

Existing competitors have limited spare capacity

(218) As shown in Table 1, the four suppliers – Tronox, Cristal, Chemours and Kronos – currently hold a combined market share of at least [90-100]% on the EEA market for chloride-based grades of titanium dioxide pigment for use in paper laminate.[232] Any potential capacity expansion would therefore need to come from the other two players for it to have a direct influence on that market.

(219) Responses to the market investigation consistently indicated that all markets for titanium dioxide pigment, including the market for chloride-based grades for use in paper laminate, are currently feeling the effects of limited capacity. A large number of customers reported that they have had direct experience of shortages of volume and restrictions to supply.[233] One customer explained that a number of chloride-based suppliers had limited availability during 2017, and that there had also been specific incidents of *force majeure*. Furthermore, when the current suppliers restricted production, no other producers were able or willing to supply the volumes needed.[234] Another customer also gave examples of shortages affecting paper laminate grades, explaining that there had been problems with availability of Kronos's grade (2800) in 2017.[235]

(220) Customers' responses were also in line with the general understanding in the industry that the market had been long over the period 2012-2015, and then started to tighten from the beginning of 2016.[236] The current tightness has thus already lasted around two years, and conditions are not expected to improve until the end of 2018 or early 2019, possibly worsening in the meantime.[237]

(221) The Notifying Party submits that Kronos had capacity utilisation of [90-100]% in 2016[238] and this is also confirmed by Kronos' own response to the market investigation, in which it stated that it was running at full capacity across all production facilities.[239] It could therefore only increase production of its chloride-based paper laminate grade by sacrificing sales of other grades and potentially not fulfilling volume agreements made with customers in other end-applications.

(222) In May 2016, Chemours announced the commercial start-up of a second production line at its Altamira plant in Mexico (where it produces its paper laminate grade). The line has nameplate capacity of 200kt/y and Chemours stated in its public announcement that production was expected to "ramp up steadily" with full nameplate capacity being achieved "over a few years".[240] The current shortage of supply (as described in recitals (220) to (221)) suggests, however, that the additional

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232 Around [0-5]% is attributed to 'others', but there is no actual evidence of any other producers offering chloride-based grades suitable for use in this area.

233 Questionnaire 1 to titanium dioxide customers, Q73.

234 Questionnaire 6 to titanium dioxide customers in paper laminate, Q74.1, ID 1692.

235 Questionnaire 6 to titanium dioxide customers in paper laminate, Q74.1, ID 2557.

236 Questionnaire 1 to titanium dioxide customers, Q74.

237 Questionnaire 1 to titanium dioxide customers, Q74.

238 See Form CO, paragraph 585; It should be noted that capacity utilisation rates are based on 'nameplate capacity' and that, according to […], effective capacity is typically between [90-100]% and [90-100]% of nameplate capacity for chloride plants, meaning that utilisation of 100% is rarely possible.

239 Questionnaire 9 to titanium dioxide competitors, Q14.

240 https://investors.chemours.com/news-releases/news-releases-details/2016/Chemours-Begins-Commercial-Operations-of-New-Altamira-TiO2-Line-in-Mexico/default.aspx.

capacity available at Altamira has not had any material effect in easing the capacity constraints faced by the industry as a whole.

(223) Information provided by the Notifying Party also indicated that increasing the capacity of a plant would be extremely costly. By way of example, the Notifying Party stated that investment of just over USD [500-1000] million would be required to increase the capacity of its […] plant by [0-500]kt/y. Chemours estimated its total capital expenditure on its expansion at Altamira at USD 600 million in an investor presentation dated June 2015. This presentation also showed that capital spending on the project began in 2012, giving an indication of the total length of time required for construction of new capacity.

Switching capacity between grades takes time and entails additional costs

(224) Any possible increase in production of chloride-based titanium dioxide pigment for use in paper laminate would therefore have to come from either Kronos or Chemours devoting a higher proportion of their existing production capacity to that end-application, or from Chemours potentially choosing to use new production capacity for production of its paper laminate grade, as and when the new production capacity becomes available. Increasing production of the grade would appear, however, to entail certain difficulties of both a technical and a commercial nature.

(225) Kronos explains that "in an effort to maximize production efficiencies, limit change overs, and due to some regulatory and process technology differences we do not produce all grades in every plant".[241] Chemours and Kronos in fact each produce their paper laminate grades at one factory only, Chemours at its Altamira plant in Mexico and Kronos at its Leverkusen plant in Germany. The Commission understands from the information provided by the Notifying Party, and confirmed by responses to the market investigation, that a particular finishing line is required for paper laminate grades, as they have a specific coating not used for other grades. This means that Chemours and Kronos could not produce their paper laminate grades at other plants without investing in new production lines or at least adding a new finishing line onto existing production lines.

(226) Furthermore, the configuration of lines generally means that only one line within a particular plant is suitable for the production of a paper laminate grade. […].[242] Cristal, however, […].[243]

(227) It follows that suppliers' ability to increase their production of chloride-based paper laminate grades would be constrained by the current set-up of their production lines. In other words, whilst it would be theoretically possible to start using a production line that is currently used for paper laminate and other grades for paper laminate exclusively, any increases beyond the capacity of the line would require time and investment (e.g. adding or adapting other production or finishing lines).

(228) A further consideration is whether competitors would incur additional costs by increasing production of their paper laminate grades. The evidence collected during the market investigation suggests that switching between grades is likely to be more problematic than the Notifying Party claimed.

(229) [Information on Cristal's costs of switching between grades].

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241 Questionnaire 2 to titanium dioxide competitors, Q16.1.

242 Based on the revised version of Annex 6.2-22 to the Form CO, submitted on 30 May 2018 and covering monthly production over the period 2016-2017.

243 Based on the updated version of Annex 3B to RFI10.

(230) The same view is shared by other producers. Kronos, for example, explained during the market investigation, in reply to the question as to whether switching between grades is disruptive, that "[y]es, it slows down the process, the time required to perform a change-over varies by grade and depending upon which grades you are changing between it often results in the creation of "transition material" which may be required to sell as "off[s]pec" at discounted prices".[244]

(231) The Notifying Party claims that increasing production of any particular grade would not, in any case, require any extra production line switches as a particular grade could simply be run for longer before switching. This may be true in principle, but is also likely to depend on the specific schedule of a particular facility and is likely to affect the speed with which a supplier can respond to a hypothetical price rise.

Competitors are unlikely to increase production of paper laminate grades

(232) Even assuming that suppliers could easily, and without significant additional costs, switch production at their plants, on the basis of the available evidence, the Commission considers it unlikely that they would have the incentives to increase production of their chloride-based paper laminate grades, were the merged entity to increase prices.

(233) First, given the current capacity constraints, dedicating a greater proportion of production time on a particular line to a paper laminate grade would inevitably mean reducing production of other grades. Customers explained that they often have yearly (or even longer) volume agreements with suppliers (whilst renegotiating price on a quarterly basis).[245] Although these volume agreements rarely take the form of binding contracts, by reneging on such an agreement, a supplier would put its relationship with the customer at risk. Particularly given the comparatively small size of the market for titanium dioxide pigment for use in paper laminate, it is at best doubtful that suppliers would be prepared to let down major customers in other sectors so as to increase their sales to paper laminate manufacturers.

(234) Second, it is important to consider how other suppliers would rationally react to a price increase on the part of the merged entity. Assuming that prices on this market are not yet (prior to the Transaction) at monopoly pricing level, given the small number of suppliers that would remain active on the market and the fairly inelastic nature of demand (there being no replacement for or alternative to titanium dioxide pigment for use in paper laminate), competitors may react to a price increase by raising their prices, but by less than the increase introduced by the merged entity, so as to benefit from some of the residual demand but at higher margins. As a result, a price increase would not be defeated, even if competitors pricing slightly lower than the merged entity would reduce the average industry price to some extent relative to the price increase introduced by the merged entity.

(235) In the Commission's view there is no indication that competitors would be likely to react to defeat a potential price rise. Chemours could potentially have additional capacity available to serve the paper laminate market, and thanks to its low production costs,[246] it may theoretically find it profitable not to follow any price

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244 Questionnaire 2 to titanium dioxide competitors, Q17.

245 Questionnaire 7 to titanium dioxide customers in coatings, Q57, Questionnaire 8 to titanium dioxide customers in plastics, Q54.

246 Average production costs in 2015 (from TZMI Comparative Cost & Profitability Study 2016): Chemours USD […]/tonne, Tronox USD […]/tonne, Cristal USD […]/tonne, Kronos USD […]/tonne, Venator USD […]/tonne. See also Reply to SO, paragraph 382.

increase in order to gain market share. However, Chemours' past behaviour suggests that it would be unlikely to compete aggressively on price. For example, in late 2015 when the five major titanium dioxide suppliers all announced price increases in quick succession, Chemours was the first to make an announcement at this time.

(236) The Commission therefore considers that capacity expansion by existing suppliers active in the production of chloride-based grades for use in paper laminate would not be sufficient to counterbalance any potential detrimental effects of the Transaction.

6.3.1.8. Barriers to entry

(237) There are two potential barriers to entry to the market for chloride-based titanium dioxide pigment for use in paper laminate: (i) barriers preventing a supplier that is already active in chloride-based production but that does not offer a grade for use in paper laminate from starting to produce such a grade, and (ii) barriers preventing new suppliers, including those currently only active in sulphate-based technology, from entering the chloride market.

6.3.1.8.1. The Notifying Party's view

(238) The Notifying Party recognises that there are significant barriers to entering the chloride-based market for titanium dioxide pigment, but claims that there are examples of successful entry in recent years. In particular, the Notifying Party points out that a number of Chinese producers have set up chloride-based manufacturing facilities in recent years,[247] and that there are possible routes to entering the market, for example with the assistance of consultants such as TiCons or through licensing of technology (as in the case of PPG and Lomon Billions). The Notifying Party also emphasises that chloride-based manufacturers outside the EEA can still compete effectively for business in this region as it is common practice to set up warehouses in the EEA from which to serve local customers.

(239) Furthermore, in the Reply to the SO, the Notifying Party explained that chloride-based suppliers are constrained by the likely entry into chloride-based supply of Chinese suppliers, which would probably be accelerated by any attempt on the part of the Parties to raise prices post-Transaction, thereby creating a further disincentive for the Parties to do so.[248] The Notifying Party also considers that Lomon Billions is ready to enter, in the near term, as a fifth EEA supplier of chloride-based titanium dioxide pigment for use in paper laminate.[249]

6.3.1.8.2. The Commission's assessment

(240) In the light of the results of the market investigation and of the other information and evidence available to it, the Commission considers that barriers to entering the market for chloride-based titanium dioxide pigment for use in paper laminate are very high, especially for those suppliers that are currently only active in sulphate-based technology. The Commission also considers that even suppliers already active in chloride-based technology are unlikely to enter the market for paper laminate grades.

(241) In view of the fact that the barriers to entry depend to some extent on a supplier's current capabilities, this topic has been assessed separately for suppliers already

247 It names Lomon Billions, Luohe Xingmao, Yibin Tianyuan and Yunnan Xinli.

248 Reply to SO, paragraph 205.

249 Reply to SO, paragraphs 214-215.

present in chloride-based production but not yet offering chloride-based paper laminate grades, and suppliers currently only present in sulphate-based production.

Barriers to entry faced by suppliers that have chloride-based production capacity

(242) The only suppliers not already present on the market for chloride-based titanium dioxide pigment for use in paper laminate that offer chloride-based grades for sale in the EEA are Venator and Lomon Billions. The latter, moreover, has started chloride-based production only recently and has very limited sales of chloride-based grades in the EEA.

(243) Given the significant differences between these two suppliers, particularly in terms of geographic presence and experience in chloride-based technology, and other factors affecting the likelihood of each to enter this market, the Commission has considered separately the barriers to entry affecting Venator and the barriers to entry affecting Lomon Billions.

(244) Venator has an established presence in chloride-based production and has a 150kt/y capacity chloride-based plant in the EEA (Greatham, UK). Venator also produces sulphate-based paper laminate grades, one of which, whilst not comparable with chloride-based grades, is generally considered to be amongst the better sulphate-based grades for this end-application. As a producer of sulphate-based pigment for use in paper laminate, Venator therefore already has the expertise required for applying the coating specific to paper laminate grades, which a supplier not yet offering any paper laminate grades would not have. Moreover, Venator is present in chloride-based production.

(245) Entering the market for chloride-based titanium dioxide pigment for use in paper laminate would, nonetheless, require a significant level of time and investment, even for a supplier already offering (sulphate-based) grades for this particular end-application. Venator itself explained, for example, that "the development of a new grade generally involves stages of: product design; manufacturing trials; customer testing; and customer acceptance. These stages may be repeated, and the sequence may vary. There is not a specific length for any of the stages, and their duration can vary. Customer testing and customer acceptance are often the longest stages in the process, and the duration of this is controlled by customers."[250]

(246) In considering the time and investment that would be required by Venator to enter the market, it is worth noting evidence from Kronos and Tronox about how long it would take them to develop a new chloride-based grade. Kronos stated that developing a new chloride-based grade would require "a significant investment in time and money".[251] Kronos's portfolio of chloride-based grades already covers all major segments within mass applications (plastics and coatings) and paper laminate. As such, the time and level of investment that Kronos would require to develop a new grade can be taken as an indication of the time and cost related exclusively to the development of a specific grade, given that it already has chloride-based technology and the general expertise required to serve all sectors.

(247) […].[252][…] Although this statement relates to a chloride-based grade for use in a different end-application, it nonetheless gives an indication of the length and complexity of the process of grade development, and of the uncertainties associated

250 Questionnaire 9 to titanium dioxide competitors, Q10.

251 Questionnaire 9 to titanium dioxide competitors, Q12.3.

252 […]. Form CO, Annex 5.4-23.

with it. Even a grade that has achieved very good results in the early stages of testing […] may require significant further development to make it capable of being produced on a commercial scale, and may even never be brought onto the market.

(248) Given that Venator does not currently have a chloride-based grade for use in paper laminate in its portfolio, it would therefore, if anything, require longer to produce such a grade than Kronos and Tronox typically do to develop new chloride-based grades for sectors where they are already present.

(249) In addition to the technical research and development (R&D) work, customer testing is often one of the lengthiest parts of the process involved in bringing a new grade onto the market. Customers active in paper laminate production reported in their responses to the market investigation that they would typically require between six and eighteen months, and potentially even longer, to qualify a new grade.[253]

(250) In conclusion, the Commission considers that Venator would need to invest significant time and resources in developing a chloride-based grade for use in paper laminate, and that there would in any case be considerable uncertainty around the outcome, despite Venator's experience in producing a sulphate-based paper laminate grade and in chloride-based technology.

(251) The second supplier with chloride-based production that is not currently present on the relevant market is Lomon Billions.

(252) The Commission is aware that Lomon Billions is developing a chloride-based grade for use in paper laminate in order to better meet the needs of customers for whom its sulphate-based grade (LR-952) is not suitable.[254] Lomon Billions' chloride-based grade for use in paper laminate is, however, a long way from entering production on a commercial scale. Lomon Billions confirmed that the R&D stage of product development had been completed, and that a European paper company had approved the new grade based on a laboratory sample. There is, however, no certainty around Lomon Billions' plans for developing this grade further. The company stated that it is not possible to make any reliable prediction as to when the chloride-based paper laminate grade will be produced on a commercial scale.[255]

(253) Furthermore, there are indications that the move to commercial scale testing may not be imminent. First, given that the grade has only, to date, been produced and tested by a customer on a laboratory scale, production would need to be scaled up, and the grade re-tested once it is being made on the production line before it could be approved for use by customers. A major customer that has tested laboratory samples of chloride-based grades of titanium dioxide pigment for use in paper laminate from a small number of Chinese manufacturers explained that the move from laboratory testing to industrial approval, and subsequently to the production of a secure and stable product on a commercial scale, takes time, and that it would therefore be, at the earliest, in 3-5 years' time that the most advanced of the grades being developed by a Chinese supplier would be available for sale.[256]

(254) Second, Lomon Billions is still in the process of bringing its new chloride-based capacity on line, and explained that all existing chloride capacity is already allocated to the production of coatings grades. Lomon Billions already has a market presence

253 Questionnaire 6 to titanium dioxide customers in paper laminate, Q66.3.

254 Response to additional request for information sent to Lomon Billions on 27 February 2018, ID 2503.

255 Minutes of call with Lomon Billions, 23 March 2018, 16.00, ID 2771.

256 Minutes of call with titanium dioxide customer, 7 March 2018, 17.00, ID 2650.

in this area, so it is potentially easier for it to increase sales in this area than to try to enter a new market.

(255) As a result, it is not clear if or when commercial-scale batches would become available, and these would, in any case, first need to undergo testing before Lomon Billions could potentially start supplying the customer that has tested its grade on a laboratory scale. Any other customers that were subsequently interested in the grade would need to go through the entire testing process, as for any other new grade. Lomon Billions explained that it has not yet been decided what its new chloride-based capacity will be used for, and that it will need to assess the commercial attractiveness of different segments. It is also unclear whether Lomon Billions would have the incentive to use a significant proportion or even any of its new capacity for the production of paper laminate grades (as opposed to grades for use in other end-applications). Paper laminate is a relatively small segment compared with other applications (such as plastics) where, in addition, Lomon Billions already has established customer relations and may therefore find it easier to increase its sales. It should also be noted that [40-50]%[257] of global sales of titanium dioxide pigment for use in paper laminate (both sulphate and chloride) are realised in China. This suggests that, even if Lomon Billions were successful in starting production of a new chloride-based paper laminate grade at some point in the future, there would be no guarantee that the grade would be exported to the EEA. If there were sufficient demand in China and other countries in that region, it may be more profitable for Lomon Billions to sell to local customers rather than shipping the product to Europe. The customer that has tested its grade on a laboratory scale also believes that Chinese suppliers have an "opportunistic approach" to the geographic location of their sales, and that exports to the EEA would depend on relative pricing between the EEA and China.[258]

(256) In addition to Lomon Billions, there are a small number of other Chinese suppliers that are understood to be at a very early stage of developing chloride-based grades for paper laminate production. Two customers are known to have tested one or more of these chloride-based grades on a laboratory scale, but the results were not successful. One customer commented: "there are initiatives ongoing in China to develop chloride grades suitable for paper laminate, but they are still far away from success (quality level and stability of quality)."[259] It explained that these grades "did not even pass the lab tests" and that the suppliers would also need to invest heavily in capacity before they could start chloride-based production. As a result, it would be "a minimum of 5-7 years before they could become active on the market".[260] Another customer explained that it had tested a chloride-based grade from the Chinese producer CITIC, but had found that the grade was "not suitable for use in laminate paper due to its colour" and "not at all comparable to the laminate paper grades produced by Tronox, Cristal, Chemours and Kronos".[261] The results of the market investigation confirm that there are no sales of this grade in the EEA.

(257) In conclusion, the Commission considers that other Chinese suppliers still have significant hurdles to overcome before they would be in a position to develop chloride-based grades for use in paper laminate successfully. First, their chloride-

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257 ID 588-19617, see also Section 6.2.2.1.2.

258 Minutes of call with titanium dioxide customer, 7 March 2018, 17.00, ID 2650.

259 Minutes of call with titanium dioxide customer, 7 July 2017, 9.30, ID 1260.

260 Minutes of call with titanium dioxide customer, 7 March 2018, 17.00, ID 2650.

261 Minutes of call with titanium dioxide customer, 22 January 2018, 09.00, ID 2312.

based capacity is still very limited and not always being operated effectively (see recitals (258) to (269) for further details) and, second, they lack the expertise to develop paper laminate grades that offer the necessary technical performance. Even setting aside these particular problems, a producer that is only at the laboratory stage of development would in any case require a number of years of further development and investment before any new grade would be ready for testing on a commercial scale.

Barriers to entry faced by sulphate-based titanium dioxide pigment producers

(258) For suppliers that are not yet present in chloride-based production at all, entry into chloride-based production would be the first hurdle in attempting to enter the market for chloride-based paper laminate grades. The difficulty associated with starting production of chloride-based titanium dioxide pigment was described by an industry report[262] published by TZ Minerals International Pty Ltd (TZMI). That report suggested that the sulphate process has lower entry barriers than the chloride process. TZMI mentioned that there are only […] licensed providers of chloride technology globally and that significant process expertise is required to operate a chloride plant.

(259) The majority of suppliers confirmed during the market investigation that their chloride-based technology is proprietary, and differs from that of competitors even if some of the main principles remain the same.[263] One major competitor stated, for example: "the production of high quality chloride based TiO_2 is equal parts art and science. […] has developed its proprietary production methods over 100 plus years and does not have specific knowledge of the details of its competitors' production process. […] production technology and methodology is highly confidential and proprietary."[264] This highlights the difficulty that a new competitor would face in entering a market where technical expertise is so critical and processes have been perfected over an extensive period of time.

(260) Competitors unanimously confirmed that it would be very difficult, if not impossible, for a sulphate-based manufacturer to enter the chloride market. The main barrier to entry is access to the technology, as the processes used for chloride-and sulphate-based production are entirely different and expertise in chloride-based technology is "closely guarded"[265] by the current main competitors and generally not licensed for use by other manufacturers. Entering the chloride market would require a very significant level of investment, but even this would not ensure successful market entry as the supplier would need to develop the skills to operate the plant successfully.[266] One competitor stated, for example, that "the key barriers to a sulphate TiO_2 producer becoming a chloride pigment producer are access to process technology and having the technical expertise and financial strength to learn how to operate the plant successfully",[267] whilst another described entry into the chloride market as "extremely unlikely".[268] One competitor estimated that the construction of a new chloride plant would cost in excess of USD 1 billion and that it would be at least five years before the plant would be operational.[269] Lastly, a competitor also

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262 "TiO_2 pigment price forecast to 2020", TZMI Q2 2016, pp. 42-43 (ID 674-18023).
263 Questionnaire 2 to titanium dioxide competitors, Q26.
264 Questionnaire 2 to titanium dioxide competitors, Q26, ID 2541.
265 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2541.
266 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2542.
267 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2542.
268 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2541.
269 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2541.

explained that the current margins mean that it would never be financially attractive for a new competitor to enter the market. This company stated that "current margins do not […] justify new greenfield capacity; we estimate that the industry would need significant margin expansion and strong long-term visibility to meet necessary return thresholds".[270]

(261) The Notifying Party mentions a small number of Chinese competitors, in addition to Lomon Billions, that it believes to have entered the chloride market in recent years: Luohe Xingmao, Yibin Tianyuan and Yunnan Xinli. None of these suppliers has, however, been able to enter the EEA market for chloride-based titanium dioxide pigment for use in paper laminate.

(262) The Notifying Party provides information (from TZMI) on the capacity of their respective plants but not on actual production levels. Total production of chloride-based titanium dioxide pigment in China reached only […] kt in 2016, for all producers combined, and it is likely that a significant proportion of this output is attributable to Lomon Billions. It is therefore uncertain to what extent other producers have been successful in starting production of chloride-based grades, what proportion of that output would be exported to the EEA, and whether any output produced would be commercially viable in terms of quality.

(263) In addition to assessing Lomon Billions' chances of entering the market for chloride-based titanium dioxide pigment for use in paper laminate, it is useful to consider Lomon Billions' route into chloride-based technology when assessing the likelihood that other Chinese suppliers will succeed. Lomon Billions was able to enter the chloride-based market thanks to sponsorship by PPG, one of the largest TiO2 customers and owner of its own chloride-based technology. PPG licensed Lomon Billions to use this technology and has provided support with setting up the plant. It has also guaranteed certain purchase volumes, thus making the project financially viable. PPG's choice to invest in this way suggests that it knows that Chinese producers would not otherwise be able to enter the chloride market. Furthermore, even with this support, the process of entering the chloride market was extremely lengthy. In a study published in 2015, TZMI reported that […].[271] PPG and Lomon Billions entered into the licensing agreement in June 2012 and PPG announced at the end of 2015 that it had started using titanium dioxide pigment from Lomon Billions, but no information was provided as to production volumes.[272] There was therefore a period of around three and a half years between the licensing and the very first sales.

(264) The other Chinese suppliers thought to be trying to start chloride-based production appear to be encountering even more serious problems:

(a) Yunnan Xinli is understood to have engaged the services of Ti-Cons, a consultancy run by former staff of Kronos (a producer that has both chloride- and sulphate-based technology).[273] In its industry report, TZMI reported that Yunnan Xinli's pigment […].[274] TZMI also noted that […].[275]

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270 Questionnaire 2 to titanium dioxide competitors, Q29, ID 2541.

271 TZMI Multiclient market study, provided by the Notifying Party as Annex 13 to the Response to the Decision opening proceedings.

272 http://corporate.ppg.com/Media/Newsroom/2015/PPG-begins-using-chloride-based-TiO2-from-Henan-Bi.

273 Minutes of call with market participant, 6 September 2017, 11.00, ID 678.

274 TZMI Multiclient market study, provided by the Notifying Party as Annex 13 to the Response to the Decision opening proceedings.

(b) Luohe Xingmao obtained approval to start production in 2016. TZMI also reported on this project in its 2015 report, and noted that Luohe Xingmao had an […]. It would also appear that the technology used for its plant was not entirely new: […],[276] again confirming the high barriers to developing chloride technology.

(c) No reference is made at all to the Yibin Tianyuan chloride plant in the TZMI report, suggesting that it may still be in a very early stage of development.

(265) TZMI also commented in its industry report on Chinese suppliers' chances of successfully entering the market for chloride technology. Its outlook was […] TZMI's views on Chinese chloride-based production in general, and on individual Chinese suppliers, clearly illustrate that Chinese producers still have significant obstacles to overcome in order to enter the chloride market in a meaningful way.

(266) The difficulties encountered by Chinese suppliers with the technology currently available to them were further confirmed by an email exchange between an independent industry consultant and Tronox. […][277] On the basis of the information provided in this email, the consultant would appear to have first-hand knowledge of the problems that Chinese producers have encountered with the […]. It follows as a result that it is not merely a question of time before Chinese suppliers master this technology. Unless they gain access to better technology, e.g. through licensing from an established supplier such as Tronox, it is likely that they will continue to struggle to make any real inroads into the chloride-based market.

(267) Furthermore, entering the chloride-based market is only the first step to being able to offer a chloride-based grade suitable for use in paper laminate. Even assuming that Chinese suppliers were at some point in time able to operate the chloride-based technology correctly, they would then need to embark on developing a chloride-based paper laminate grade, which would itself require significant financial investment and several years of R&D, followed by lengthy customer testing (see recitals (248) to (251)).

(268) The technical difficulties associated with developing a chloride-based titanium dioxide pigment grade for use in paper laminate combined with the relatively small size of the market mean that it is not generally perceived to be a particularly attractive market to target for new entry.[278]

(269) This is consistent with the view expressed in Cristal's internal documents, where […].[279] […].[280] There is thus no indication that Cristal is fearful of those suppliers entering the market for chloride-based grades for use in paper laminate. This supports the Commission's conclusion that, not only is the number of suppliers currently present on this market limited, but so is the number of suppliers that would be capable of competing.

(270) In conclusion, the Commission considers that market entry is very difficult and that the competitive pressure that could be exerted by any suppliers outside the four

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275 TZMI Multiclient market study, provided by the Notifying Party as Annex 13 to the Response to the Decision opening proceedings.

276 TZMI Multiclient market study, provided by the Notifying Party as Annex 13 to the Response to the Decision opening proceedings.

277 ID 1980-1812.

278 Questionnaire 6 to titanium dioxide customers in paper laminate, Q65, ID 1692.

279 […], ID 588-19617.

280 Internal documents, ID 588-19617.

currently offering chloride-based grades for use in paper laminate is likely to be extremely limited.

6.3.1.9. Lack of countervailing buyer power

6.3.1.9.1. The Notifying Party's view

(271) The Notifying Party claims that customers enjoy significant buyer power.

(272) First, the Notifying Party submits that customers have typically qualified a large number of grades and are therefore able to switch suppliers easily and to play suppliers off against one other in negotiations by threatening to switch. The Notifying Party also claims that qualification can be completed in between three and twenty-four months and is not an onerous undertaking for a customer.

(273) Second, the Notifying Party points to the concentrated demand-side structure of the market as an indication of countervailing buyer power, citing the fact that the top three paper laminate customers account for [80-100]% of Cristal's sales in this segment and the top five for [90-100]%. In the Notifying Party's view, this gives the largest customers significant negotiating power as they account for a large proportion of a supplier's sales.

6.3.1.9.2. The Commission's assessment

Importance of multi-sourcing

(274) The Commission notes that customers find it necessary to multi-source for reasons linked to security of supply, and that this makes a further reduction in the number of potential suppliers particularly problematic.

(275) Customers explained that the main reason for multi-sourcing is to ensure security of supply, as they are aware that there can be shortages.[281] [282] One customer explained, for example, that "we need to buy from several suppliers to secure all the volumes we need. Also we have to mitigate the risk, if any of the existing suppliers cannot supply."[283] A number of customers also explained that they had, in the past, experienced problems with supply[284] and this motivated their decision to source from as many suppliers as possible. One customer noted that "we have seen very often technical and supply problems with the TiO2 suppliers. Therefore we try to source min 3-4 suppliers to get safe supply and (little) competition on market price."[285] Several customers described situations in which suppliers had had production problems and had declared *force majeure*, thus leaving them without the supplies they needed.[286] On some occasions, this had had serious consequences for customers as they were not able to find other suppliers with available volume and had thus been forced to stop their own production.[287]

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281 Questionnaire 1 to titanium dioxide customers, Q52.
282 Questionnaire 1 to titanium dioxide customers, Q54.
283 Questionnaire 1 to titanium dioxide customers, Q52, ID 2536.
284 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73, Q74.
285 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73, ID 2557.
286 Questionnaire 6 to titanium dioxide customers in paper laminate, Q74.1.
287 Questionnaire 6 to titanium dioxide customers in paper laminate, Q74.2.

(276) The vast majority of the major customers on the market for chloride-based titanium dioxide pigment for use in paper laminate (Schoeller Technocell, Kaindl, Ahlstrom-Munksjö and Koehler) consider that two suppliers would not provide sufficient protection against the risk of supply shortages.[288] One customer explained, for example: "two suppliers is somehow risky. If we just would imagine that one supplier has a problem, there is only another one to cover the needs."[289] Another customer echoed this same concern, "if one has a production problem, the other one would not be able to supply that much more".[290] Respondents also indicated that using only two suppliers would give them even less negotiating power with respect to prices.[291]

(277) Customers active in paper laminate production considered (on average) three suppliers to be the minimum for their business to be viable.[292] As shown in Table 2, while small customers (with less than 1kt/y consumption and collectively accounting for only [0-10]% of total EEA demand in 2016) tend to purchase from just one supplier, most large customers currently rely on three to four chloride-based titanium dioxide pigment suppliers. Koehler is the only major customer to have sourced from only two chloride-based suppliers in 2016.[293] Cristal's internal market intelligence[294] shows, […].

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288 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73. No other customer replied to this question.

289 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73, ID 1692.

290 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73, ID 2560.

291 Questionnaire 6 to titanium dioxide customers in paper laminate, Q73.

292 Questionnaire 6 to titanium dioxide customers in paper laminate, Q72.

293 The market investigation indicates that the maximum proportion of titanium dioxide pigment purchases that customers allocate to a single supplier varies significantly. Some customers active in paper laminate production would allocate as much as 50% to one supplier, while others were not comfortable having more than 30% of their needs met by any one single supplier, due to the difficulty of finding an alternative source if that supplier was unable to deliver the required volume (Questionnaire 1 to titanium dioxide customers, Q55).

294 […] presented in slide 14 to ID676-15823.

Table 2 – Multi-sourcing of major paper laminate customers in EEA

EEA customer, 2016	Parties' common customer	Chloride volume	Top supplier	Top 2 suppliers	Top 3 suppliers	Deduced number of chloride-based suppliers
[…]	[…]	[…]	**[60-80]**%	**[80-100]**%	**[80-100]**%	4 suppliers (*)
[…]	[…]	[…]	**[40-60]**%	**[80-100]**%	**[80-100]**%	4 suppliers
[…]	[…]	[…]	**[40-60]**%	**[60-80]**%	**[80-100]**%	4 suppliers
[…]	[…]	[…]	**[40-60]**%	**[60-80]**%	**[80-100]**%	3 suppliers
[…]	[…]	[…]	**[40-60]**%	**[80-100]**%		2 suppliers
[…]	[…]	[…]	**[40-60]**%	**[80-100]**%	**[80-100]**%	3 suppliers
[…]	[…]	[…]	**[80-100]**%			1 supplier
[…]	[…]	[…]	**[80-100]**%			1 supplier
[…]	[…]	[…]	**[80-100]**%			1 supplier
[…]	[…]	[…]	**[80-100]**%			1 supplier
[…]	[…]	[…]	**[80-100]**%			1 supplier

Source: Adapted from Table 8 of the Notifying Party's reply to the SO and underlying data provided in "Table 8 - Paper Laminate Share of supplier 2016.xlsx".

(*)**[…]**.

(278) While only […] paper laminate customers are customers of both of the Parties, they accounted together for [a significant share] of the total EEA demand in 2016. Post-Transaction, these […] customers would necessarily lose one competing source of supply. The remaining (major) customers that do not currently source from both of the Parties would lose the possibility of leveraging the qualification of a potential alternative fourth source of supply in their bilateral negotiations and would therefore be left with no choice but to source from all the remaining chloride-based suppliers.

(279) In the Reply to the SO, the Notifying Party claimed that the market for titanium dioxide pigment for use in paper laminate displays a considerable level of volume churn for both Parties and that this shows that customers have the ability to employ a significant degree of bargaining power.[295] The Notifying Party estimated the churn rate on the assumption that a customer is counted as having 'churned' if the Party's sales to that specific customer increased or decreased by more than 30% between two consecutive years. The Commission considers that this methodology does not provide a sufficiently reliable measure of the actual churn because it does not take into account changes in customers' total demand. Given the cyclical nature of the market, demand can be subject to substantial fluctuations on a yearly basis and any variation in a supplier's sales to a customer may in reality reflect changes in the customer's total demand (as opposed to switching between suppliers). Contrary to the conclusions reached by the Notifying Party, the available evidence suggests that paper laminate customers tend to be reluctant to shift volumes frequently between suppliers. This is also demonstrated by customers' responses to the market investigation. One customer explained, for example, that: "it doesn't have the flexibility to change its allocation every quarter" since "its priority is security of

295 Reply to SO, paragraphs 273 to 279.

supply. By using three suppliers, it is implicitly paying more than it would if it allocated all its purchases to the cheapest of the three."[296]

(280) Switching is particularly difficult in cases where an alternative grade has not yet been qualified. Customers generally regard the need to approve suppliers and individual grades as a significant barrier to switching as it requires extensive testing.[297] They explained that they typically try not to change grades as this would oblige them to change their product formulation.[298]

(281) The Commission therefore concludes that multi-sourcing is an important feature of the market for chloride-based titanium dioxide pigment for use in paper laminate. Customers multi-source primarily for reasons linked to security of supply and each of the four largest customers (collectively accounting for [the vast majority]% of EEA demand in 2016) sources from at least three chloride-based suppliers. A market with only three suppliers would leave customers with virtually no ability to leverage negotiating power as they would be forced to source from all three.

Even large customers do not have significant negotiating power

(282) Contrary to the Notifying Party's claim that customers have considerable negotiating power thanks to the concentration of demand, customers active in paper laminate production explained that they are often prevented from switching suppliers due to both the difficulties associated with qualifying new grades and the lack of alternative suppliers with volume available.

(283) One customer commented, for example, that "la qualification d'un fournisseur est longue et couteuse".[299] As described in the previous section, most customers are already restricted in their ability to switch suppliers by the lengthy approval process for new grades and the difficulties involved in finding alternative products that perform in the same way in their production.

(284) As described in more detail in recitals (285) to (287), customers' responses to the market investigation and information from the Parties' internal documents suggest that paper laminate customers rarely move away from a main supplier entirely, as it would be too difficult to find the required volumes elsewhere. Several customers active in paper laminate production explained that they had habitually struggled to obtain volumes from suppliers.

(285) It emerged very strongly from the market investigation [some suppliers]"allocate" volumes to customers, which are often less than the customer was hoping to purchase. Finding these "missing" volumes elsewhere can then be very difficult for customers. One customer commented, for example, that "suppliers sometimes refuse to allocate volumes".[300] Customers explained in general that they have to negotiate for volumes as well as on price.[301] One customer stated, for example, that "it is very challenging to change supplier (impossible for larger volumes!)".[302]

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296 Minutes of call with titanium dioxide customer, 7 March 2018, 17.00, ID 2648.

297 Questionnaire 1 to titanium dioxide customers, Q71-72.

298 Questionnaire 6 to titanium dioxide customers in paper laminate, Q71.

299 Questionnaire 1 to titanium dioxide customers, Q80.3, ID 2538 (Translation: "Qualifying a new supplier is a long and costly process").

300 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.

301 Questionnaire 6 to titanium dioxide customers in paper laminate, Q53.1.

302 Questionnaire 6 to titanium dioxide customers in paper laminate, Q44, ID 1692.

(286) Evidence from internal documents also confirms that […].[303][…].[304]

(287) Tronox's […] also demonstrate that […][305][…][306] This highlights the uncertainty faced by customers and their vulnerability to suppliers deciding to reduce their orders, potentially without warning.

(288) In conclusion, the Commission considers that even large paper laminate customers, despite their significant purchases, have only limited negotiating power, especially when the market is tight. The Transaction would further reduce customers' ability to bargain as they would have one competitor less to which they could threaten to switch. The lack of negotiating power is exacerbated by customers' need to multi-source in order to have sufficient security of supply.

6.3.1.10. Lack of competition from neighbouring market for sulphate-based pigment

6.3.1.10.1. The Notifying Party's view

(289) The Notifying Party maintains that it is not meaningful to analyse markets restricted to chloride-based titanium dioxide pigment only, either at an overall level or within specific end-applications. It emphasises that the same characteristics are important to customers in all segments (brightness, opacity, colour, tinting strength and undertone, dispersion and durability) and that chloride and sulphate grades compete in the vast majority of end-uses in the areas of coatings, plastics and paper.

(290) In particular, the Notifying Party submits that customers can use sulphate-based grades in all end-applications, including paper laminate. It claims that the costs of switching are not prohibitive and that customers can reformulate their products to accommodate sulphate- or chloride-based grades.

(291) The Notifying Party also submits that, even if customers can only switch some of their titanium dioxide pigment usage from chloride to sulphate grades, this would be enough to defeat a price increase, meaning that there is no justification for defining separate markets.

(292) In terms of the competitive constraint exercised by suppliers of sulphate-based grades in general, the Notifying Party submits that eastern European, Ukrainian and Chinese[307] suppliers offer a wide range of grades, have a significant market share, and are perceived by the Parties (as evidenced by internal documents) as competitors for their customers. Furthermore, the Notifying Party points out that Tronox […].

6.3.1.10.2. The Commission's assessment

(293) The Commission recognises that competitive pressure could theoretically be exerted by sulphate-based titanium dioxide pigment on the market for chloride-based titanium dioxide pigment for use in paper laminate.

(294) The results of the market investigation and other evidence available to the Commission suggest, however, that, even if competitive pressure from sulphate-based titanium dioxide pigments cannot be entirely discounted, the effect is likely to be minimal.

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303 ID 585-19770.

304 ID 585-16960.

305 ID 666-111.

306 ID 643-9363.

307 The Notifying Party quotes Cristal's [internal documents] to illustrate the competitive constraint exerted by sulphate manufacturers, in particular from China.

(295) As discussed in Section 6.2.1.3, the responses to the market investigation suggest that it would be very difficult for customers active in paper laminate production to replace chloride-based grades with sulphate-based grades. Customers emphasised the importance of chloride-based grades for ensuring that the finished product has the necessary whiteness and opacity. One customer explained that using "more sulphate grades would not allow us to meet our customer specifications in terms of optical properties"[308] and another customer confirmed that "in high white paper laminate grades, chloride pigments cannot be substituted".[309] The specific properties of chloride-based titanium dioxide pigments are clearly essential for paper laminate producers, and sulphate-based grades cannot offer a reasonable alternative. One customer explained, for example, that "[the] characteristics of chloride TiO_2 give better quality of opacity, brightness and colour".[310]

(296) The lack of competition from sulphate-based titanium dioxide pigment is also confirmed by comments made by the Parties in internal documents. […].[311][…].[312] This is consistent with the views expressed by customers with respect to the proportion of sulphate grades they can use, and in particular that a sulphate grade will never really compete with the chloride-based grades as it does not itself deliver the properties needed and is used only as a "filler" alongside a much larger proportion of chloride-based grades.

(297) In conclusion, the Commission considers that the competitive constraint exerted by sulphate-based titanium dioxide pigment on the market for chloride-based titanium dioxide pigment for use in paper laminate is very limited, given customers' inability to switch from chloride- to sulphate-based grades. The presence of sulphate-based suppliers cannot be considered to have any effect on the competitive dynamics on the market for chloride-based paper laminate grades, as customers have a specific requirement for chloride-based titanium dioxide pigment for use in paper laminate that cannot be compromised.

(298) The Commission therefore considers that any potential competitive constraint from sulphate-based titanium dioxide pigment would not be in any way sufficient to replicate the competitive pressure on the relevant market that would be lost post-Transaction.

6.3.1.11. Effects of the Transaction

6.3.1.11.1. The Notifying Party's view

(299) The Notifying Party submits that, irrespective of the precise market definition considered, customers' concerns about potential price rises may be more related to the current situation on the market than to their expectations with respect to the Transaction. In the Notifying Party's view, because the titanium dioxide market is currently tight and prices may rise further, the price level may be higher following the Transaction than it is now, but not necessarily as a result of the Transaction, but merely because prices were set to increase further anyway.

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308 Questionnaire 1 to titanium dioxide customers, Q11, ID 2519.
309 Questionnaire 1 to titanium dioxide customers, Q11, ID 2536.
310 Questionnaire 1 to titanium dioxide customers, Q11, ID 2520.
311 ID 676-15338, […].
312 ID 2061-1536.

6.3.1.11.2. The Commission's assessment

(300) The Commission considers that the Transaction would result in a significant loss of competition. Cristal's strength is evident from its considerable market share in the EEA and Tronox, despite its notionally smaller market share, also constitutes an important competitive force for the reasons set out in Section 6.3.1.5. In the light of: (i) the very concentrated nature of the market, with only four suppliers being present, (ii) the fact that all suppliers compete closely with one another, (iii) the difficulty of switching between grades, (iv) the barriers to expansion, (v) the barriers to entry, (vi) the lack of countervailing buyer power, and (vi) the lack of competition from sulphate-based pigments, the Commission considers that each of the Parties exerts an important competitive constraint on the other (as well as on Chemours and Kronos). The Transaction would therefore remove this competitive constraint.

(301) The results of the Commission's market investigation show that customers are concerned about the consequences of a further reduction in the already limited number of suppliers and further consolidation on an already concentrated market. Almost all customers that responded to the Commission's market investigation expressed serious concerns as to the possible consequences of the Transaction and indicated in their responses that they expect the Transaction to have a negative impact on the market.[313]

(302) Customers specifically fear that competition between suppliers would be further limited by the Transaction, and that they would have even fewer options, thus increasing the market power of the merged entity and a very small number of other players.[314] Furthermore, the concerns expressed by customers demonstrate that they already view the market as not being very competitive, thus making the loss of one player all the more critical. One customer referred to the "disappearance of a competitor from a not very competitive market"[315] and another commented that "the market seems to be quite consolidated already".[316]

(303) Furthermore, the views expressed demonstrate that customers are particularly concerned by the prospect of potential price increases and view suppliers as being in a powerful position on this market. One major customer stated, for example, that "the new company would have enough power together with Chemours to dominate the market for laminate grade TiO2 (and probably also others). This could lead to increased prices which would not happen in a more fragmented market. It can be expected that those two suppliers would try to stabilize the "normal" volatility of the TiO2 market at the moment of a high pricing period to avoid a price erosion like we have seen it after the last shortage 2010-2012. With being number 1 and 2, they would have lots of power to influence this market."[317]

(304) In the Reply to the SO, the Notifying Party pointed to the fact that this particular customer currently only sources 20% of its overall (chloride and sulphate) requirements from Cristal and only 10% from Tronox, and claimed that this illustrates the limited role played by Tronox and the major role played by the

313 Questionnaire 6 to titanium dioxide customers in paper laminate, Q75, Q76.

314 Questionnaire 1 to titanium dioxide customers, Q81.

315 Questionnaire 1 to titanium dioxide customers, Q81, ID 2538.

316 One customer commented that "the market seems to be quite consolidated already" (Questionnaire 1 to titanium dioxide customers, Q81, ID 2536).

317 Questionnaire 6 to titanium dioxide customers in paper laminate, Q76.1, ID 1692.

remaining chloride and sulphate competitors.[318] Contrary to the Notifying Party's view, the Commission considers that this does not show that Tronox's role in the market is limited. On the contrary, if anything, it clearly illustrates that this customer multi-sources from different suppliers, that post-Transaction the merged entity will represent 30% of its supplies and that this customer would not be able to play the merging parties off against each other anymore. Given the level of concentration in the market pre-Transaction, the removal of a competitive force such as Tronox, which for this client represents 10% of its supplies, cannot be regarded as negligible.

(305) The Commission also observes that even large customers, which multi-source from several chloride-based suppliers and additionally source some sulphate-based grades, are concerned about the Transaction and its potential effects on the market. Views such as these, expressed by sophisticated customers, suggest in particular that Tronox's role on the market cannot be ignored, despite its relatively modest market share. Responses received from customers reflect the risk that the removal of one of the four suppliers active on this market would eliminate an important competitive constraint, with all respondents active in paper laminate production stating that the Transaction would have an impact on the market.[319]

(306) The fear that the merged entity could gain a significant degree of market power and would be able to dictate prices is shared by almost all market participants. One customer stated, for example, that "the new company would have increased power to determine the market".[320] Many others predicted price increases as a direct consequence of the reduction in the number of major competitors.[321] The level of concern felt by paper laminate customers was also reflected in one plea to the Commission: "Pls b[e] very critical into this acquisition".[322]

(307) In addition to the potential effect on prices, there are indications that the Parties may rationalise their portfolio of chloride-based grades for use in paper laminate post-Transaction. This would reduce choice, force customers to incur additional costs in qualifying an alternative grade and also put security of supply at greater risk.

(308) Customers see portfolio rationalisation as a likely outcome of the Transaction, and are thus even more concerned about the consequences for security of supply. One customer explained, for example, that "both companies offer one specific chloride-grade to the paper laminate industry. We expect that one of these grades would disappear."[323] Other respondents observed: "As Tronox and Cristal each offer a grade for the use in paper laminate, it is very likely that one of them will disappear in order to create synergies."[324] and: "The new company (Tronox and Cristal) could optimize their product portfolio. As each of them has one plant producing C[hloride]P[rocess] laminate grades (Cristal in [the EEA] and Tronox in [the EEA]), they could focus on only one production site. This would reduce the supply safety."[325] As set out in the last statement, portfolio reduction is likely to involve limiting the production of paper laminate grades to one line, which would further reduce security of supply for

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318 Reply to SO, paragraph 205.
319 Questionnaire 6 to titanium dioxide customers in paper laminate, Q75.
320 Questionnaire 1 to titanium dioxide customers, Q81, ID 2519.
321 Questionnaire 1 to titanium dioxide customers, Q81.
322 Questionnaire 6 to titanium dioxide customers, Q77, ID 2557.
323 Questionnaire 1 to titanium dioxide customers, Q81, ID 2536.
324 Questionnaire 6 to titanium dioxide customers in paper laminate, Q76.2, ID 2560.
325 Questionnaire 6 to titanium dioxide customers in paper laminate, Q76.2, ID 1692.

customers as there would be one fewer source of paper laminate grades, making the impact of production problems at any particular site even more serious.

(309) Indications given in the Parties' own documents also suggest that customers' concerns are not unfounded. […][326] Although, in the Reply to the SO, the Notifying Party claims that this document […], this leaves little doubt that […].

(310) Documents prepared by Tronox (and by Tronox and Cristal jointly) as part of planning for the acquisition also suggest, more generally, that […].[327]

(311) In more detailed plans for the integration of the two businesses (a presentation entitled […].[328][…].

(312) This is also confirmed by other references made in internal emails. During internal email exchanges […].[329][…]. Given the relative similarity of the various paper laminate grades, the Commission considers it likely that the Parties' two grades for use in this area would be amongst the candidates for rationalisation.

(313) A number of other internal documents and emails circulated within Tronox also refer to […].[330] on occasions when customers have enquired whether grades may disappear post-Transaction, […], Tronox has not denied, and in some cases even confirmed to customers, that grade rationalisation may well take place.[331]

(314) The Transaction could therefore reduce customers' security of supply and negotiating power, not only as a result of the loss of one supplier, but also potentially the loss of one of the only four grades that are suitable for use in paper laminate. Any product rationalisation would thus significantly reduce the choice of chloride-based paper laminate grades available to customers and would result in customers incurring additional costs and inconvenience as a result of the need to qualify a new grade.[332] In addition, as discussed in detail in Section 6.3.1.9.2, security of supply is an issue of major concern to customers active in the production of paper laminate, and portfolio consolidation would be likely to further reduce security of supply.

6.3.1.12. Conclusion on non-coordinated horizontal effects in the EEA market for chloride-based titanium dioxide pigment for use in paper laminate

(315) The Commission concludes that the notified concentration would significantly impede effective competition on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, in particular for the following reasons: (i) closeness of competition, (ii) elimination of an important competitive force in an already concentrated market, (iii) the difficulty experienced by customers in switching between suppliers, (iv) the existence of high barriers to expansion, (v) the existence of high barriers to entry, (vi) the lack of countervailing buyer power, (vii) the lack of competitive pressure from neighbouring markets for sulphate-based pigments, and (viii) the probable negative effects of the Transaction as regards potential portfolio rationalisation.

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326 ID 2061-841.
327 ID 1975-12412.
328 ID 1980-7962.
329 ID 1980-8409.
330 See, for example, internal documents with IDs 1980-3450, 625-4208, 674-1782, 674-14985.
331 IDs 1980-8150, 583-46104.
332 Minutes of call with titanium dioxide customer, 22 January 2018, 9.00, ID 2312.

6.3.2. Non-coordinated horizontal effects in the markets for titanium dioxide pigment for use in mass applications

6.3.2.1. Market structure

(316) Titanium dioxide pigment for use in mass applications is sold to customers active in the production of plastic and coatings. The Transaction would not create an affected market[333] when considering a potential single market for titanium dioxide pigment for use in mass applications and, of the two potential sub-markets, one for titanium dioxide pigment for use in coatings and one for titanium dioxide pigment for use in plastics, only the coatings sub-market would be affected, the Parties having a combined market share of slightly above [20-30]% in 2016, as shown in Table 3.

Table 3: Market shares for titanium dioxide pigment used in mass-applications and its plausible sub-segments (sales volumes in EEA)

in %	2014			2015			2016		
	Mass-appli-cations	*thereof:* Coatings	Plastics	Mass-appli-cations	*thereof:* Coatings	Plastics	Mass-appli-cations	*thereof:* Coatings	Plastics
TRONOX	[5-10]	[5-10]	[5-10]	[5-10]	[5-10]	[5-10]	[5-10]	[5-10]	[5-10]
CRISTAL	[5-10]	[10-20]	[5-10]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]
COMBINED	[10-20]	[10-20]	[10-20]	[10-20]	[20-30]	[10-20]	[10-20]	[20-30]	[10-20]
CHEMOURS	[10-20]	[5-10]	[10-20]	[5-10]	[5-10]	[10-20]	[10-20]	[5-10]	[10-20]
VENATOR	[20-30]	[20-30]	[20-30]	[20-30]	[20-30]	[20-30]	[20-30]	[20-30]	[20-30]
KRONOS	[10-20]	[10-20]	[30-40]	[10-20]	[10-20]	[30-40]	[10-20]	[10-20]	[20-30]
CHINESE	[5-10]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]
EAST-EUROPEAN	[5-10]	[5-10]	[0-5]	[5-10]	[5-10]	[0-5]	[5-10]	[5-10]	[5-10]
UNKNOWN/ OTHER	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]	[10-20]
Total	100	100	100	100	100	100	100	100	100

Source: Data provided by the Notifying Party (Annex 11 in response to RFI 15)

(317) Market shares for the potential narrower markets for titanium dioxide pigment for use in specific types of coatings are shown in Table 4. As can be seen from the data, the only plausible market that would be affected by the Transaction is the market for titanium dioxide pigment for use in architectural coatings, where the Parties had a combined market share of [20-30]% in 2016.

333 For the definition of what an 'affected market' is, please see the Merger Regulation, Annex 1.

Table 4: Market shares for titanium dioxide pigment used in plausible coatings sub-segments (sales volumes in EEA)

in %	2014			2015			2016		
	Archi-tectural	Industrial	Thin film	Archit-ectural	Industrial	Thin film	Archi-tectural	Industrial	Thin film
TRONOX	[5-10]	[5-10]	[0-5]	[10-20]	[5-10]	[0-5]	[10-20]	[5-10]	[0-5]
CRISTAL	[10-20]	[0-5]	[10-20]	[10-20]	[5-10]	[10-20]	[10-20]	[5-10]	[10-20]
COMBINED	[20-30]	[10-20]	[10-20]	[20-30]	[10-20]	[10-20]	[20-30]	[10-20]	[10-20]
CHEMOURS	[5-10]	[10-20]	[20-30]	[5-10]	[10-20]	[20-30]	[5-10]	[10-20]	[20-30]
VENATOR	[30-40]	[10-20]	[5-10]	[30-40]	[10-20]	[10-20]	[30-40]	[10-20]	[10-20]
KRONOS	[10-20]	[10-20]	[30-40]	[10-20]	[5-10]	[30-40]	[10-20]	[5-10]	[30-40]
CHINESE	[5-10]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]
EAST-EUROPEAN	[10-20]	[5-10]	[0-5]	[5-10]	[5-10]	[0-5]	[5-10]	[5-10]	[0-5]
UNKNOWN/ OTHER	[0-5]	[30-40]	[10-20]	[0-5]	[30-40]	[10-20]	[0-5]	[30-40]	[10-20]
Total	100	100	100	100	100	100	100	100	100

Source: Data provided by the Notifying Party (Annex 11 in response to RFI 15)

(318) Market shares for the potential narrower markets for titanium dioxide pigment for use in specific types of plastics are shown in Table 5. As can be seen from the data, the Transaction would lead to affected markets in relation to titanium dioxide pigment for use in engineering plastics, where the Parties had a combined market share of [20-30]% in 2016, and titanium dioxide pigment for use in polyolefin, where the Parties had a combined market share of [20-30]% in 2016.

Table 5: Market shares for titanium dioxide pigment used in plausible plastic sub-segments (sales volumes in EEA)

in %	2014			2015			2016		
	Engi-neering	Polyolefin	PVC	Engi-neering	Polyolefin	PVC	Engi-neering	Polyolefin	PVC
TRONOX	[20-30]	[5-10]	[0-5]	[20-30]	[5-10]	[5-10]	[20-30]	[5-10]	[5-10]
CRISTAL	[0-5]	[10-20]	[5-10]	[0-5]	[10-20]	[5-10]	[0-5]	[10-20]	[5-10]
COMBINED	[20-30]	[10-20]	[5-10]	[20-30]	[20-30]	[10-20]	[20-30]	[20-30]	[10-20]
CHEMOURS	[5-10]	[20-30]	[0-5]	[5-10]	[10-20]	[0-5]	[5-10]	[10-20]	[5-10]
VENATOR	[20-30]	[20-30]	[10-20]	[20-30]	[20-30]	[10-20]	[20-30]	[20-30]	[10-20]
KRONOS	[40-50]	[10-20]	[60-70]	[40-50]	[10-20]	[60-70]	[40-50]	[10-20]	[50-60]
CHINESE	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]	[0-5]	[0-5]	[0-5]
EAST-EUROPEAN	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]
UNKNOWN/ OTHER	[0-5]	[5-10]	[0-5]	[0-5]	[5-10]	[0-5]	[0-5]	[0-5]	[0-5]
Total	100	100	100	100	100	100	100	100	100

Source: Data provided by the Notifying Party (Annex 11 in response to RFI 15)

6.3.2.2. The Notifying Party's view

(319) The Notifying Party submitted that market shares are only slightly above [20-30]% in most cases and that the merged entity would continue to face strong competition from a number of major suppliers. As regards architectural coatings, the market in which the Parties have the highest combined market share, the Notifying Party points out that Venator would remain a stronger player than the merged entity with a market share of [30-40]% compared to the Parties' combined market share of [20-30]%.[334]

(320) In addition, the Notifying Party argued that imports to the EEA from China are increasing. While this is, in the Notifying Party's view, relevant for all types of titanium dioxide pigment, it is claimed to be particularly relevant for grades used for architectural coatings. In this segment, [50-60]% of grades used are sulphate-based and, according to the Notifying Party, Asian producers exert a particularly strong competitive constraint on western producers (including the Parties). The Notifying Party claimed that the Parties had tested […]. The Notifying Party also pointed out that Lomon Billions had recently made announcements relating to the development of a high performance grade for use in architectural coatings that has been developed in cooperation with customers.[335]

334 Form CO, paragraph 580.

335 Response to Decision opening the proceedings, paragraph 151-155.

6.3.2.3. The Commission's assessment

(321) The Commission notes that the Transaction does not lead to an affected market in a single market for mass applications.[336]

(322) Under a narrower market definition, the potential market for titanium dioxide pigment used in coatings would be affected ([20-30]% in 2016), as would one of its potential sub-segments, namely architectural coatings ([20-30]% in 2016)..

(323) In the EEA, Venator has a significantly larger market share than the merged entity would have, and Venator is the market leader in both architectural coatings and coatings overall. In addition, Kronos and Chemours are both also strong competitors in these markets, albeit with lower market shares than the merged entity.

(324) The majority of customers that responded to the Commission's market investigation indicated that they regard all five major players as strong suppliers of titanium dioxide pigment for use in coatings. Several customers also listed eastern European suppliers such as Cinkarna and Precheza among the top suppliers of coatings grades in the EEA[337] whilst others indicated that they regard Police and Lomon Billions as credible suppliers of pigment for coatings, including architectural coatings.[338] Furthermore, the results of the market investigation did not suggest that either of the Parties has a particular strength that could not be replicated by the remaining players on the market[339] or that there are any specific types of coatings for which only Tronox and Cristal provide suitable grades.[340]

(325) Of the various plausible markets for titanium dioxide pigment for use in plastics, only the markets for polyolefin and for engineering plastics would be affected by the Transaction. On the polyolefin plastics segment, the merged entity would have a market share of [20-30]% (with an increment of [5-10]% brought by Tronox). Venator would, however, remain the market leader (with a market share of [20-30]%), and both Chemours ([10-20]%) and Kronos ([10-20]%) would remain active on the market with market shares only slightly below that of the merged entity. Eastern European suppliers are also present in this segment with a total market share of [5-10]%, while Chinese suppliers account for [0-5]% of sales. The merged entity would therefore continue to face competitive pressure from a significant number of other suppliers.

(326) On the engineering plastics segment, Cristal has a very minor presence, with a market share of only [0-5]%. Post-Transaction, the merged entity would have a market share of [20-30]% and would continue to face competition from market leader Kronos ([40-50]%), from Venator ([20-30]%) and from Chemours ([5-10]%).

(327) Customers' responses to the Commission's market investigation confirm that there are a number of strong suppliers offering alternatives to the Parties' products, and suggest that the Parties' grades are not particularly close substitutes for one

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336 Although the Parties' combined market share on the overall market for mass application grades in the EEA […] exceeded 20% in 2015, it [the Parties' combined market share on the overall market for mass application grades in the EEA was below [20-30]% in 2016]. The Commission has no indications that the Parties' 2017 market shares would be significantly higher than those seen in the previous year.

337 Questionnaire 7 to titanium dioxide customers in coatings, Q50.

338 Questionnaire 7 to titanium dioxide customers in coatings, Q55.

339 Questionnaire 7 to titanium dioxide customers in coatings, Q50, Q56.

340 Questionnaire 7 to titanium dioxide customers in coatings, Q48, Q53.

another.[341] The majority of respondents appear to regard Kronos, Venator and Chemours as stronger suppliers than the Parties in the area of plastics.[342]

(328) The Commission therefore considers that the merged entity would continue to face significant competition from its main rivals Kronos, Venator and Chemours, as well as smaller eastern European and Chinese players on all plausible markets for titanium dioxide pigment for use in mass applications. The Transaction is not therefore likely to significantly impede effective competition on any of these markets, irrespective of whether the relevant product market is further segmented by end-application.

6.3.2.4. Conclusion on non-coordinated horizontal effects in the EEA markets for titanium dioxide pigment for use in mass applications

(329) The Commission considers that the notified concentration would not significantly impede effective competition in any market or sub-market for titanium dioxide pigment for use in mass applications.

6.3.3. Coordinated horizontal effects in titanium dioxide pigment markets

6.3.3.1. Introduction

(330) The Commission has assessed whether the Transaction is likely to result in coordinated effects on one or more of the plausible EEA markets for titanium dioxide pigment.

(331) The markets affected by the Transaction present certain characteristics which can make coordination likely to emerge. In particular, there are a limited number of players that account for a large proportion of sales, titanium dioxide is a relatively homogeneous product, there is a high level of transparency in the market, and – albeit in a different jurisdiction – there were indications of the same companies (or their legal predecessors) engaging in anticompetitive conscious parallelism.[343]

(332) The Commission has not, however, found sufficient evidence to conclude that the Transaction would be likely to lead to coordination among the remaining major suppliers of titanium dioxide pigment. In particular, it cannot be established that there exists a clear focal point that suppliers could use to coordinate their behaviour.

6.3.3.2. Relevant legal context

(333) According to the case law, coordinated effects may arise "as the result of a concentration where, in view of the actual characteristics of the relevant market and of the alteration in its structure that the transaction would entail, the latter would make each member of the dominant oligopoly, as it becomes aware of common interests, consider it possible, economically rational, and hence preferable, to adopt on a lasting basis a common policy on the market with the aim of selling at above

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341 Questionnaire 8 to titanium dioxide customers in plastics, Q48, Q49.

342 Questionnaire 8 to titanium dioxide customers in plastics, Q46, Q47, Q51.

343 In 2013, coatings manufacturer Valspar brought an action in the US against Huntsman (now Venator), Kronos, Millennium (now Cristal) and DuPont (now Chemours), but also referring to Tronox as a co-conspirator for alleged coordination of price increases that had been taking place since 2002. All cases were settled out of court with the exception of that against DuPont. While no sufficient evidence of an active conspiracy was found, the court highlighted that the market for titanium dioxide pigment in the US was primed for anticompetitive interdependence of the five suppliers. See US Court of Appeals for the 3rd circuit, *Valspar v. DuPont* (No. 16-1345).

competitive prices, without having to enter into an agreement or resort to a concerted practice within the meaning of Article 81 EC."[344]

(334) According to the Horizontal Merger Guidelines, horizontal mergers may significantly impede effective competition (a) by increasing the likelihood that firms are able to coordinate successfully, or (b) by making existing coordination easier, more stable or more effective, either by making the coordination more robust or by permitting firms to coordinate on even higher prices, for example by facilitating the detection of deviation, limiting the ability and incentives of some market players to deviate and allowing more efficient retaliation.[345]

(335) Coordination may take various forms, such as setting prices above the competitive level, limiting production or capacity, dividing the market, for instance by geographic areas or other customer characteristics, or by allocating contracts in bidding markets.[346]

(336) Coordination is more likely to emerge in markets where it is relatively simple to reach a common understanding on the terms of coordination. This is the case where coordinating firms have similar views regarding which actions would be considered to be in accordance with the aligned behaviour and which actions would not.[347] The less complex and the more stable the economic environment (for example, oligopolistic markets), the easier it is for the firms to reach a common understanding on the terms of coordination.[348] In addition, firms may find it easier to coordinate if they are relatively symmetric, especially in terms of cost structures, market shares, capacity levels, and levels of vertical integration.[349]

(337) Coordinating firms may also find ways to overcome problems stemming from complex economic environments, for example by establishing a small number of reference pricing points, or a fixed relationship between base prices and a number of other prices. Market transparency resulting from publicly available key information or, for example, from information exchanged through structural links between competitors may further facilitate coordination.[350]

(338) According to relevant case law, specific emphasis should be placed on the actual economic mechanism according to which tacit coordination is likely to operate.[351] The mechanism in question must be consistent with the current market conditions and integrate the industry features prone to induce coordinated behaviour. Furthermore, the ways in which the main actors are likely to reach terms of coordination and, in particular, the parameters that lend themselves to being a focal point of coordination, should be assessed. Finally, a specific focus should be given to whether potential coordination is likely to be sustainable.

(339) In general, three features of the market may provide indications as to whether coordination is likely to be sustainable. First, the coordinating firms should be able to monitor to a sufficient degree whether the terms of coordination are being adhered

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344 T-342/99 *Airtours v Commission*, ECLI:EU:T:2002:146, para 61. See also Commission Guidelines on the assessment of horizontal mergers, para 39.

345 Commission Guidelines on the assessment of horizontal mergers, para. 42.

346 Commission Guidelines on the assessment of horizontal mergers, para. 40

347 Commission Guidelines on the assessment of horizontal mergers, para 44.

348 Commission Guidelines on the assessment of horizontal mergers, para 45.

349 Commission Guidelines on the assessment of horizontal mergers, para 48.

350 Commission Guidelines on the assessment of horizontal mergers, para 47.

351 Case *Bertelsmann and Sony Corporation of America v Impala,* ECLI:EU:C:2008:392, para. 125.

to. Second, coordinating firms are more likely to adhere to coordinated behaviour if the incentives not to deviate deter them from departing from the coordinated action. Third, the reactions of outsiders, such as current and future competitors not participating in the coordination, as well as customers, should not be able to jeopardise the results expected from the coordination or the effect of their reaction would be too small to effectively counterbalance the effect of potential coordination on the relevant market.[352]

(340) In assessing whether it would be possible to reach terms of coordination and whether the coordination is likely to be sustainable, the Commission takes account of all the changes that a transaction is likely to bring about. The reduction in the number of players resulting from the concentration may, in itself, be a factor that facilitates coordination. However, other factors that may increase the likelihood or significance of coordinated effects could also be taken into account.[353]

6.3.3.3. The Notifying Party's view

(341) The Notifying Party submits that the market for titanium dioxide supply in the EEA is not structurally conducive to coordinated effects because: (i) it is highly cyclical, with volatile demand which would make it difficult for suppliers to reach terms of and sustain coordination, (ii) there is a significant competitive constraint exercised by suppliers other than the main five players, in particular Chinese suppliers, which would destabilise any tacit coordination, and (iii) there is substantial asymmetry between the various western suppliers in terms of production costs, capacity, degree of vertical integration and geographic presence, which leads to diverging incentives in terms of price level, output and market share.

(342) The Notifying Party furthermore submits that there is no plausible theory of coordination in the EEA. In particular, the Notifying Party submits that prices are determined through complex bilateral negotiations and that there is limited transparency on prices and volumes, making coordination difficult to reach and sustain. Moreover, prices differ substantially across customers (for the same grade and for similar volumes) and also vary over time, which would mean coordination on prices would have to take place on a customer-by-customer basis and be re-established frequently. The Notifying Party submits that price increase announcements do not act as a focal point for coordination, as these differ substantially from the price changes actually negotiated with customers.[354]

(343) The Notifying Party further submits that the market for titanium dioxide pigment is not transparent as: (i) price increases are no longer announced publicly and there is very limited visibility of the actual prices negotiated by competitors, (ii) […], and (iii) all other information (on revenue, capacity and inventory levels) released into the public domain via investor calls and/or financial reports is highly aggregated and therefore insufficient to help sustain any possible coordination equilibrium.

(344) The Notifying Party also submits that the EEA market for titanium dioxide pigment is competitive, as evidenced by the fluctuations in market shares and the high degree of customer churn between the main suppliers.

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352 See Case *Airtours v Commission*, cited *ut supra* paragraph 62 ; and Case C-413/06 P *Bertelsmann and Sony Corporation of America v Impala*, cited *ut supra*, paragraph 123. See alsoHMG, para. 41.

353 Commission Guidelines on the assessment of horizontal mergers, para 42.

354 Form CO, Annex 6.3-1.

6.3.3.4. The Commission's assessment

6.3.3.4.1. Market structure

(345) As described in Section 6.3.2.1, there are currently five main players active on the EEA markets for titanium dioxide pigment for use in coatings and plastics (and their possible sub-segments). Four of these players are also the only suppliers active on the EEA market for chloride-based pigment for use in paper laminate.

(346) In total, when combining sales for titanium dioxide pigment used in mass-applications and chloride-based titanium dioxide pigment used in paper laminate, the five leading players account for almost [70-80] of all titanium dioxide pigment sold in the EEA. The other players include Chinese suppliers, which, according to the Notifying Party accounted for less than [5-10]% of total sales in 2016, and several smaller eastern European suppliers, which accounted for [5-10]% in total. The Notifying Party was unable to allocate [10-20]% of sales to specific competitors, which means that the proportion of the market held by the leading players may actually be higher than suggested by the market shares.

6.3.3.4.2. Reaching terms of coordination

(347) The Commission has investigated whether the five main titanium dioxide pigment suppliers could be coordinating their pricing behaviour on the basis of parallel price increase announcements.[355] During the period 2015-2017, the Parties and their main competitors announced several price increases of similar magnitude and at similar points in time. These announcements were either published on the suppliers' websites or communicated to customers through letters. As described further in Section 6.3.3.4.3, there is a high level of transparency in the market which allows suppliers to obtain information about their competitors' price announcements even when these announcements are made by letter.

(348) One episode of price increase announcements stands out as an illustration of parallel behaviour. On 17 December 2015, Chemours publicly announced a generalised net price increase of USD 150 per tonne applicable to all titanium dioxide grades sold in all regions. The next day, Tronox and Venator followed suit, announcing the same price increase. Kronos and Cristal had both done likewise by 22 December, announcing price increases of the very same amount. The Parties' internal documents indicate that […].[356]

(349) This series of closely aligned price increase announcements that occurred in December 2015 has to be analysed in the context in which it arose. Prices for titanium dioxide pigment had been falling since 2012 and industry experts did not expect an imminent recovery in the market. In a report published in December 2015, TZMI, the main data provider covering the titanium dioxide pigment industry, noted

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355 The Commission notes that the five major suppliers of titanium dioxide pigment (or their legal predecessors) have been involved in several legal proceedings relating to coordinated behaviour in the US. The US Court of Appeal in a recent judgement related to the action brought in 2013 by Valspar, a large coatings manufacturer, against DuPont (now Chemours) concluded that some characteristics of the US titanium dioxide pigment market were '*conducive of price fixing*' and that the market was *'primed for anticompetitive interdependence and it operated in that manner*.' (US Court of Appeals for the 3rd circuit, *Valspar v. DuPont* (No. 16-1345).

356 For example, a few hours after Chemours' announcement, […] (ID 643-3671). Cristal's price increase announcement also appears to be a response to the price increase of competitors: […]. (ID 585-69433).

that "[…]." TZMI expressed scepticism as to whether market fundamentals would support the announced price increases: "[…]".[357]

(350) The Parties' internal documents seem to suggest that […].[358] The Parties also note internally that a […].[359]

(351) The Commission therefore sought to establish whether the price increases that started as of the second quarter of 2016 were due, at least in part, to the coordinated conduct of suppliers, acting on the basis of parallel price increase announcements, and whether the five main players could coordinate their pricing behaviour in this manner in the future.

(352) Price increase announcements can facilitate coordination as they set out a single and exact amount by which prices should be increased. In principle, the price increase amount announced could act as a focal point of coordination.

(353) However, as emphasised by the Notifying Party in the Reply to the SO, the evolution of the Parties' average prices does not reveal a clear relationship between price increase announcements and the price increases achieved in practice. Following the price increase announcements of December 2015, Tronox's and Cristal's actual average prices in the EEA decreased by EUR […] per tonne and EUR […] per tonne, respectively. […]. For instance, Tronox announced an increase of EUR […] per tonne for both the last quarter of 2016 and the first quarter of 2017, while the actual price increases achieved in those two quarters were EUR […] per tonne and EUR […] per tonne, respectively. Likewise, Cristal implemented […]% of its announced third quarter 2016 increase of EUR […] per tonne, whereas in the first quarter of 2017 it announced an increase of EUR […] per tonne, of which it implemented EUR […] per tonne.

(354) In the Reply to the SO the Notifying Party also points to the heterogeneity in the way price increase announcements are implemented at customer level. Titanium dioxide pigment prices are negotiated bilaterally between the supplier and the customer, typically on a quarterly basis. Depending on the customer, the duration and timing of negotiations can vary. Some customers conclude negotiations well in advance of the start of the quarter to which the price applies, while others engage in several rounds of discussions, which may even continue during the quarter in question.[360] The price depends *inter alia* on the volume ordered, the customer's strategic importance (e.g. in terms of its existing or potential long-term relationship with the supplier), delivery conditions (e.g. lead time, packaging requirements etc.), payment terms, and competing offers received by the customer from other suppliers. Some (typically large) customers also receive rebates if their purchases reach certain volume thresholds.[361] Customers that purchase multiple grades from a supplier may be charged a grade-specific price or, more commonly, a single price for all grades purchased.[362]

(355) With regard to the first quarter of 2016, the Commission notes that the actual price changes faced by Tronox's customers varied between […]. The situation was similar for Cristal, for which price changes varied between […] per tonne per customer.

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357 Form CO, Annex 5.4-81 (December 2015).

358 ID 588-63273 and ID 589-16585

359 ID 583-38649.

360 Tronox and Cristal […] reports provided in response to question 9 of RFI 6.

361 Reply to question 6 of RFI 6. Annex 6.3-1. Reply to question 2 of RFI 8.

362 Reply to the Decision opening proceedings.

While prices started to increase for the vast majority of customers as of the second quarter of 2016, the actual amounts again varied considerably, from […] per tonne to […] per tonne for Tronox and […] per tonne to […] per tonne for Cristal. Even for customers purchasing similar volumes, the actual price changes appear to vary significantly. For instance, Cristal's ten largest customers[363] faced price changes between […] per tonne in the first quarter of 2016 and between […] per tonne in the second quarter of 2016.[364]

(356) The significant variation in actual prices between customers suggests that the price increase indicated in the announcements would, of itself, be unlikely to provide an effective focal point for coordination. Nonetheless, the Commission has considered whether price increase announcements may be combined with alternative mechanisms of coordination and used as a trigger for coordinated strategies.

(357) The evidence analysed by the Commission does not, however, indicate that a mechanism of coordination of this type was being employed. There is no clear incumbent or leader at market level or, with some exceptions, at customer level,[365] and no compelling evidence that the Parties took such positioning into account in their negotiations with customers. Likewise, while the Parties consider the customer's characteristics in deciding on the implementation of price increases (and may, as such, be firmer in increasing prices charged to smaller customers), there is no compelling evidence to suggest that this is the result of coordinated rather than unilateral conduct.

(358) In conclusion, in light of the differences between the price increases announced and the actual price variations over time (as well as the large divergence in prices between customers), the Commission considers that, despite some episodes of closely parallel conduct in recent years, there is no sufficiently clear evidence of any actual mechanism on the basis of which coordination could operate in the EEA titanium dioxide pigment markets. In view of the relevant case law (see recital (338)), and in the absence of sufficiently clear indications of a credible focal point, the likelihood of coordinated effects cannot be established. Nevertheless, for completeness, the Commission has assessed whether in theory – assuming that a mechanism of coordination existed – the coordination would be sustainable.

6.3.3.4.3. Market transparency and the ability to deter deviations

Market transparency

(359) For coordination to be sustainable, the coordinating firms need to be able to monitor sufficiently accurately whether the terms of coordination are being adhered to. Markets therefore need to be transparent enough to allow the coordinating firms to monitor whether other firms are deviating and thus to know when to retaliate.

(360) The Commission assessed the extent to which information on critical parameters of competition, such as prices, volumes, capacity and inventory levels, is sufficiently transparent in the titanium dioxide pigment market.

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363 In terms of annual volumes purchased for the year 2015, excluding distributors.

364 Based on data provided in Annexes 8A and 8B in response to RFI 10.

365 As described in further detail in Section 6.3.1.9.2, the majority of customers prefer, for security of supply reasons, to split their purchases of titanium dioxide pigment across several suppliers rather than allocating the majority of their volumes to a single 'incumbent' supplier.

(361) As regards prices, although the Parties […],[366] [the Parties' internal documents show that customers share information with suppliers about the timing, amount and date of application of price increases announced by competitors].[367] [368] [369] The Notifying Party[370] submits that information provided by customers is usually unreliable as customers often bluff to trigger competition between suppliers. While there are cases where the Parties' sales representatives suspected customers of bluffing, these appear to be only isolated episodes. Moreover, occasional bluffing can be spotted by comparing information across customers.[371]

(362) As regards volumes, the Commission notes that […].[372][…] By looking at the size of a customer's orders over time and given their knowledge of the customer's other sources of supply, the Parties can infer, albeit with some margin of error, whether and when their supply share and their competitive position relative to other suppliers changes.

(363) As regards other parameters of competition, the Commission notes that, with the exception of Cristal, all other main suppliers are public companies. Their quarterly financial reports and investor calls include information on revenue, volumes sold, capacity and inventory levels.[373] The information shared in investor calls describes not only past performance but also often refers to suppliers' future plans. For example, in its investor call for the first quarter of 2016, Tronox's CEO indicated that "we don't intend to bring back the full production instantaneously simply because we could see the very first signs of price recovery. […] We understand balancing supply and demand is going to be an important part of that and we intend to be disciplined about it. So, no, I would not expect us to crash the market with bringing all that back shortly."[374]

(364) Overall, the Commission considers that there is significant transparency in the market for titanium dioxide pigment as regards pricing and other parameters of competition, even though the information collected by suppliers is not always entirely accurate. In any case, the Commission does not need to conclude as to whether the market transparency would be sufficient to reach a common understanding and monitor a coordinated strategy as, absent clear evidence on the focal point around which suppliers would align their strategy (see Section 6.3.3.2), it

366 Form CO, Annex 6.3-1, page 42.

367 See, for instance, […]. (ID 643-9105). […] (ID 645-39826).

368 Tronox' and Cristal's [internal documents]for the period 2015-2017 provided in response to RFI 6, question 9. A number of Cristal's [internal documents] have also been provided in response to RFI 1, question 40.

369 For example, [excerpts from Parties' internal documents referencing exact prices or price increases applied by competitors at specific customer accounts].

370 Form CO, Annex 6.3-1, page 41.

371 Titanium dioxide supplier ISK, for example, explains that "we can catch the market movement from the comment of many customers. Therefore if one or two customers make "bluff", we can recognize that it is bluff or not". Similarly, Cinkarna mentions that "we serve a lot of customers and levels are known." Questionnaire 2 to titanium dioxide competitors, Q54, Internal documents, ID 1033 and 2540.

372 See […] (reply to RFI 13, Annex 6) and Tronox's […] files (for example, ID 548-27007).

373 […] (ID 1975-14806).

374 Likewise, in its earnings call for the fourth quarter of 2015, Chemours' CEO explains the company's plans as regards capacity expansion: "obviously we're not going to get to the 200 KT right off the bat with Altamira. You have to ramp up as we're bringing it up. […] But we're not going to ramp up right to 200 KT. But your logic is exactly right. As we bring that up we will take down that same amount of capacity throughout the circuit until the market improves or our customer needs increase."[374]

cannot be concluded that suppliers are likely to coordinate as a result of the Transaction.

Deterrence mechanisms

(365) For a finding of coordinated effects, the situation of tacit coordination should be sustainable over time, that is to say, there must be an incentive not to depart from the common policy.[375] Coordination is not sustainable unless the consequences of deviation are sufficiently severe to convince coordinating firms that it is in their best interests to adhere to the terms of coordination. Such a threat is only credible if, where deviation by one of the firms is detected, there is sufficient certainty that some deterrent mechanism would be activated.[376]

(366) The Commission found evidence suggesting that the prospect of intense price competition is perceived as a significant threat by the Parties and may discourage aggressive conduct.

(367) There are instances where the fear of retaliation in the form of a "price war" or a "downward spiral" seems to have induced the Parties not to undercut competitors. Internal documents contain references to the fact […]. For example, […][377]

(368) There appears to be a shared view within the industry that a price war could be seriously damaging to profitability. This understanding became particularly clear at the end of 2015, after a period of intense price competition that had led to falls in the revenue and profitability of all major players. Cristal's internal documents defined […][378]. Similarly, Chemours and Huntsman (Venator) referred to profitability and the pricing environment for titanium dioxide pigment as "unsustainable".

(369) The Commission notes that, for a retaliation mechanism to be credible, it is not necessary to target the deviator specifically. While targeted retaliation may be relatively more efficient to implement than a generalised price war, the latter can nonetheless be an effective retaliation strategy. This is acknowledged by Professor P. Rey in his submission on behalf of the Notifying Party: "as competition tends to dissipate profit, a “return to competition” could indeed constitute in some instances a sufficient threat to sustain [coordination]".[379] In any case, the Commission considers that the market transparency[380] might allow suppliers to target retaliation at the deviating company. In addition, the main suppliers are active globally, compete in different geographic regions and interact on a quarterly basis, which would potentially offer a wider set of options for retaliating and would also ensure that any punishment could be implemented promptly.

(370) Overall, the information and the evidence available to the Commission suggests that the fear of a return to competition may deter companies from putting in place strategies that could be perceived as aggressive attempts to go after competitors' volume or business. The Commission does not, however, need to conclude as to whether the threat of future retaliation in this case would be sufficient to sustain a coordinated strategy as, absent clear evidence on the focal point around which

375 See Case T-342/99, *Airtours v. Commission*, cited *ut supra,* paragraph 62.

376 Horizontal Merger Guidelines, paragraph 52.

377 Cristal can be seen to take a similar approach in early 2016 at a time when it was attempting to increase prices: […]

378 […], 7 December 2015 (ID 585-76843).

379 Reply to SO, Appendix D.

380 See recitals (359) to (364).

suppliers would align their strategy (see Section 6.3.3.4.2), it cannot be concluded that suppliers would be likely to coordinate as a result of the Transaction.

6.3.3.4.4. Reactions of outsiders

(371) For coordination to be successful, the actions of outsiders such as non-coordinating firms, potential competitors and customers, should not be able to jeopardise the results expected from the coordination.[381] The Commission assessed whether existing or new competitors would be likely to undermine any potential coordination scheme. In particular, the Commission looked at: (i) the competitive constraint exerted by existing smaller European suppliers, and (ii) the competitive constraint exerted by competitors from China. As regards countervailing buyer power, the arguments discussed above in Section 6.3.1.9. in relation to the non-coordinated effects apply *mutatis mutandis* to the additional markets on which coordination may take place post-Transaction.

(372) As far as the market for chloride-based titanium dioxide pigment for use in paper laminate is concerned, the Commission concluded that any supplier other than the Parties, namely Chemours and Kronos, exerted a limited competitive constraint (see Section 6.3.1.7).

(373) The outcome of the market investigation is less clear, however, when it comes to the role played by eastern European and Chinese suppliers in the markets for titanium dioxide pigment for use in mass applications.

(374) Eastern European suppliers (Cinkarna, Precheza and Police)[382] are seen by some customers as credible alternatives, at least for part of their titanium dioxide requirements for use in mass applications, and these suppliers therefore exert some competitive constraint on the five main actors. Nonetheless, this constraint appears to be somewhat limited as eastern European suppliers have a relatively small portfolio of grades, which includes only sulphate based grades that are typically not suitable for end users requiring high whiteness or durability in coatings[383] or high performance in plastics.[384]

(375) The Commission also notes that Chinese suppliers have increased their sales in the EEA in recent years and that a number of customers currently source from and consider Chinese suppliers to be valid alternatives.[385] Yet, some evidence casts some doubt on the question as to whether Chinese suppliers would have sufficient capacity

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381 Horizontal Merger Guidelines, para 56.

382 The Ukrainian players do not seem to play any relevant part in those e-mails at all. This can be explained by the fact that at least Crimea Titan is affected by the import ban being part of the EU restrictive measures in response to the crisis in Ukraine.

383 Questionnaire 7 to titanium dioxide customers in coatings, Q21 responses show that switching from a chloride grade to a sulphate grade is more difficult than switching between two chloride grades for a large majority of coatings manufactures while 90% of respondents to Q25 confirmed that sulphate based grades are more yellowish. Replies to Q25.1. further confirm that this effect cannot be fully compensated for many producers or that it would be at least be highly complex to do so.

384 Questionnaire 8 to titanium dioxide customers in plastic, Q26.1.2. responses show that switching from chloride to sulphate grades is only possible for a limited part of demand (between 30 and 50%) for plastic producers (excluding distributors). As regards high-quality polyolefin / masterbatch two thirds of respondents replied in response to Q27 that they would continue to buy these specific grades even if prices for these would increase relative to others while replies to Q28 show that these grades are almost exclusively provided by the five large suppliers, excluding Eastern European producers.

385 Reply to SO, paragraph 522.

to accommodate additional demand from EEA customers,[386] whether they would have the incentive to export to the EEA (as opposed to using the additional capacity to meet local demand in China),[387] and whether customers would be willing to source significant volumes from Chinese competitors due to possible concerns about their quality level and consistency,[388] lead times,[389] breadth of product portfolio,[390] higher transport costs[391] and import duties.[392]

(376) Overall, the Commission considers that, while it is unclear whether or not the actions of these players would be liable to undermine any potential coordination scheme, the evidence available suggests that eastern European and Chinese producers exert some constraint on the five largest players in the markets for titanium dioxide pigment for use in mass applications. In any case, the Commission does not need to conclude as to whether the reaction of non-coordinating companies would be sufficient to destabilise the effects of potential coordination between the five large players as, absent clear evidence on the focal point around which suppliers would align their strategy (see Section 6.3.3.4.2), it cannot be concluded that suppliers would be likely to coordinate as a result of the Transaction.

6.3.3.4.5. The impact of the Transaction on coordination

(377) The Commission assessed whether the Transaction would increase the likelihood that titanium dioxide pigment suppliers would coordinate their behaviour and raise prices, or would make such coordination easier, more stable or more effective for firms.

(378) Some evidence gathered during the market investigation suggests that consolidation of the market may trigger more disciplined conduct, which could potentially favour attempts to reach and sustain price coordination on the supply of titanium dioxide pigment. First, the Parties themselves, in particular Cristal, often mentioned […][393] and this view is shared by industry experts.[394] Second, the Transaction may improve market transparency.[395] Third, the Transaction would create another (almost) pure-

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386 A recent assessment undertaken by TZMI forecasts […] in overall Chinese capacity between 2018 and 2020 (Tio2 Pigment Supply / Demand Feb. 2017, TZMI). While […], old sulphate capacity is being […] due to the tightening of […].

387 According to TZMI (Tio2 Pigment Supply / Demand Feb. 2017) Chinese supply will […] to fully meet local demand after the closure of additional sulphate capacity: "[…]". This is also supported by Tronox's CEO who "[Assessment of level of Chinese supply"] (ID 2635). It is also questionable whether Chinese new-chloride capacity can be as cost-effective as the capacity installed in the EEA: "[…]" (ID 583-37012).

388 Chinese suppliers are often seen as performing worse than Western European players with respect to critical characteristics such as whiteness, brightness and opacity (Questionnaire 1 to titanium dioxide customers, Q58, Q65).

389 Questionnaire 1 to titanium dioxide customers, Q45, Q65, Q67.

390 Questionnaire 2 to titanium dioxide competitors, Q65, Q66).

391 Questionnaire 1 to titanium dioxide customers, Q45.

392 Questionnaire 1 to titanium dioxide customers, Q67.

393 For example, […]. (ID 588-59376)

394 For example, ICIS, a major petrochemical data provider, commented on Tronox's acquisition of Cristal (in February 2017) as follows: "Tronox's proposed acquisition of Cristal is the latest example of market consolidation that should lead to more price discipline in titanium dioxide (TiO2)". Article by Al Greenwood for ICIS Chemical Business: https://www.icis.com/subscriber/icb /2017/02/24/10081883/ news-focus-new-era-dawns-for-titanium-dioxide/ (ID 2645).

395 The removal of Cristal would further facilitate gathering of market intelligence because (i) there would be one supplier less to monitor and (ii) Cristal is not a publicly listed company and therefore it is currently not subject to the same public scrutiny as listed companies and information on its key performance indicators is less readily available than for Tronox, Chemours and Venator. For example, quarterly reports and earning calls with investors are important sources of information for titanium

play titanium dioxide pigment supplier which could make the merged entity more likely to pursue a disciplined strategy on prices than is Cristal currently.[396, 397]

(379) It is unclear, however, whether, and if so how, the Transaction would materially improve suppliers' ability to reach terms of coordination. As set out Section 6.3.3.4.2, absent clear evidence on the focal point around which suppliers would align their strategy, it cannot be concluded that suppliers would be likely to coordinate as a result of the Transaction. Also, the remaining main suppliers would continue to face some competition from eastern European and Chinese producers post-Transaction.

6.3.3.5. Conclusion on coordinated effects

(380) In view of the above considerations, the Commission concludes that the notified concentration would not significantly impede effective competition in the EEA markets for rutile titanium dioxide pigment for use in coatings and plastics (and their possible sub-segmentations) or for chloride-based titanium dioxide pigment for use in paper laminate as a result of coordinated effects.

6.3.4. Overall conclusion to the competitive assessment of the EEA markets for titanium dioxide pigment

(381) For the reasons set out in Section 6.3.1, the Commission concludes that the notified concentration is likely to significantly impede effective competition on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, as a result of non-coordinated horizontal effects. However, for the reasons set out in Section 6.3.2, any non-coordinated horizontal effects on the various plausible markets for titanium dioxide pigment for use in mass applications (and their possible sub-segmentations) would not significantly impede effective competition. Similarly, for the reasons set out in Section 6.3.3, coordinated horizontal effects would not significantly impede effective competition on the EEA markets either for rutile titanium dioxide pigment for use in mass applications (or possible sub-segments) or for chloride-based titanium dioxide pigment for use in paper laminate.

6.4. Efficiencies

(382) On 7 March 2018, the Notifying Party submitted a paper on efficiencies ("the Efficiencies paper"). The Notifying Party then submitted further arguments and

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dioxide pigment suppliers, as evidenced by the fact that the Parties closely follow competitors' calls and discuss the information provided during the call internally. Cristal is not required to publish quarterly reports and/or attend calls with financial investors.

396 Some commentators also noted that pure-titanium dioxide pigment players are more likely to pursue a disciplined strategy on prices than companies active in many different industries as the latter's consolidated earnings tend to be less sensitive to price volatility on the titanium dioxide pigment market (ID 2645). This view is apparently shared by Cristal, who noted, in an internal presentation, […]. In recent years, two of the largest suppliers (Chemours and Venator) become independent titanium dioxide pigment producers (Chemours spun off DuPont in 2015 and later Huntsman spun off its pigments business to Venator in mid-2017). As pointed by some commentators, the Transaction may further contribute to the creation of a pure-play market where the four major suppliers in the industry would be almost exclusively active in titanium dioxide pigment: "if everything goes through [it refers to Tronox's proposed acquisition of Cristal] and all is said and done, there would be four major Western players in TiO2 that are all relatively pure-play – Tronox, Chemours, Venator Materials and Kronos Worldwide" (ID 2645).

397 Pure-play suppliers are also typically more transparent and this could enable more effective monitoring as any data released in the public domain does not include (or includes to a limited extent) figures related to non-TiO2 activities. This is well illustrated by the following email, […] (ID 585-60319).

evidence in support of its efficiency claims, first on 5 April 2018 in the Reply to the SO and then on 18 April 2018 in the Response to the Letter of Facts.

6.4.1. Relevant legal context

(383) For the Commission to take account of efficiency claims in its assessment of a concentration and be in a position to weigh such efficiencies against any anticompetitive effects of the concentration, the efficiency claims must be substantiated and must satisfy the three cumulative criteria defined in the Horizontal Merger Guidelines, namely:[398]

(a) *Benefit to consumers*: efficiencies have to benefit consumers in the sense that they should be substantial and timely. Such benefits should, in principle, benefit consumers in the relevant markets where it would otherwise be likely that competition concerns would occur.[399]

(b) *Merger specificity*: efficiencies have to be a direct consequence of the merger and cannot be achieved to a similar extent by less anticompetitive alternatives.[400]

(c) *Verifiability*: efficiencies have to be verifiable such that the Commission can be reasonably certain that the efficiencies are likely to materialise and to be substantial enough to counteract a merger's potential harm to consumers.[401]

(384) The burden of proof for showing that efficiencies fulfil these criteria lies with the merging parties as most of the information is solely in their possession. It is, therefore, incumbent upon the merging parties to provide, in due time, all the relevant information necessary to demonstrate that the claimed efficiencies are merger specific and likely to be realised. Similarly, it is for the merging parties to show to what extent the efficiencies are likely to counteract any adverse effects on competition that might otherwise result from the merger, and therefore benefit consumers.[402] Furthermore, evidence relevant to the assessment of efficiency claims includes, in particular, internal documents used by the management to decide on the merger, statements from the management to the owners and financial markets about the expected efficiencies, historical examples of efficiencies and consumer benefit, and external experts' pre-merger studies on the type and size of efficiency gains, and on the extent to which consumers are likely to benefit.[403]

6.4.2. Efficiency claims submitted by the Notifying Party

6.4.2.1. Capacity expansion

(385) The Notifying Party submits that the Transaction would increase the Parties' effective capacity for titanium dioxide pigment production by at least […] kt/y. Around […] kt/y of this increase would be achieved through improvements that Tronox believes it is capable of making at Cristal's Yanbu plant and around […] kt/y through the sharing of best practices at other plants.

(386) The Notifying Party claims that this capacity expansion would exert downward pressure on prices in the EEA, thus benefiting customers.

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398 Horizontal Merger Guidelines, paragraph 78.
399 Horizontal Merger Guidelines, paragraph 79.
400 Horizontal Merger Guidelines, paragraph 85.
401 Horizontal Merger Guidelines, paragraph 86.
402 Horizontal Merger Guidelines, paragraph 87.
403 Horizontal Merger Guidelines, paragraph 88.

6.4.2.1.1. Capacity expansion at Cristal's Yanbu plant

(387) The Notifying Party submits that it would be able to increase the effective capacity of the Yanbu plant to […] kt/y by 2021, representing an increase of […] kt/y relative to Cristal's forecasts for the plant.[404]

(388) The Notifying Party claims that Tronox would be able to increase the effective capacity at Yanbu in a way that Cristal has not been able to, due to its superior experience and understanding of the low-pressure chloride technology used at Yanbu. The Yanbu plant was built as a joint venture between Cristal and Tronox's predecessor company, Kerr-McGee, and the Notifying Party claims that it has a very similar design to the Tronox plant in […]. In the Reply to the SO, the Notifying Party set out the […]and pointed to internal documents prepared by the Parties in support of this claim.[405]

(389) The Notifying Party submits that the Parties would continue to be […], and that the increase in capacity therefore constitutes a merger-specific change, which would benefit EEA customers. In particular, the Notifying Party claims that the expansion at Yanbu is merger-specific because Tronox is the only player capable of operating such a plant at full nameplate capacity.

(390) The Notifying Party submits that the merged entity would have the incentive to make full use of the increased production capacity as major competitors (Chemours and Lomon Billions) are in the process of increasing their production capacity, and the merged entity would therefore need to do the same to maintain its market share.

(391) The Notifying Party argues that an increase in capacity at Yanbu would benefit EEA customers as a result of direct sales from Yanbu to the EEA, and through the redirection of other volumes that are currently exported from the EEA. In particular, the Notifying Party emphasises that Cristal sold […] kt of titanium dioxide pigment produced at the Yanbu plant in the EEA in 2017, and that this demonstrates that there are no barriers to trade. In addition, according to the Notifying Party, EEA customers would benefit from the increased production capacity at Yanbu even if the additional volumes produced are sold in the Middle East, as this would reduce the exports from the EEA to this region.

6.4.2.1.2. Capacity expansion at other plants

(392) The Notifying Party submits that the combination of the Parties' intellectual property and best practices would lead to an increase in effective capacity at the Parties' other plants of [0-10]% relative to the level that each firm would achieve on its own. This improvement would affect […] (excluding Yanbu, which is considered separately), and corresponds to an increase in effective capacity of […] kt/y.[406]

(393) In the Reply to the SO, the Notifying Party submitted a series of documents that purported to substantiate the claimed increase in capacity of [0-5]%. The Notifying Party also explained that the implementation of the "Tronox Way", […], is expected to lead to a production increase of […]kt/y at […] and […]kt/y at […].[407]

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404 The Notifying Party acknowledges that part of the expected increase in production at the Yanbu plant will be used in the production of […] but maintains that, even taking this into account, there would be an increase of around […] kt/y of capacity that would be used for titanium dioxide pigment production.

405 Reply to SO, para 600.

406 Efficiencies paper, page 10.

407 Reply to SO, paragraph 627.

(394) The Notifying Party submits that such improvements are merger-specific as the Parties would not otherwise have any incentive to exchange best practices, and also that the improvements would benefit EEA customers as they would apply to the Parties' plants in the EEA.[408]

6.4.2.2. Increased production of feedstocks and vertical integration

(395) The Notifying Party also submits that the Transaction would allow the merged entity to source a greater proportion of feedstocks internally, which would lead to variable cost savings equal to the difference between the cost of external sourcing and the internal cost of production.

(396) The increase in internal sourcing may come from: […].

(397) Tronox indicated in its current business plan that (absent the Transaction) it would […]. Tronox acknowledges that […]. As a consequence, there may not be any material savings in variable costs from redirecting excess production to Cristal.[409] Accordingly the Notifying Party focuses its efficiency claim on the additional feedstock production at […].

(398) The Notifying Party submits that, absent the Transaction, Tronox would […]. Cristal, meanwhile, currently has a […]. Post-Transaction, the merged entity would have the incentive to […]. The Notifying Party claims that this would generate cost savings of around USD […].

6.4.2.3. Jazan slagger

(399) The Notifying Party submits that, if Tronox is able to bring into operation Cristal's slagging facility, the Jazan slagger, which is currently idle, this would bring a further increase in feedstocks production of around […] titanium dioxide units.

(400) Construction of the Jazan slagger was completed in 2015, but Cristal […]. Tronox believes that it has the necessary expertise to solve the problems encountered by Cristal. In March 2018, Tronox signed a technical service agreement ("TSA") with AMIC[410] under which Tronox agreed to offer specific services with the aim of resolving various problems encountered with the operation of the slagger.

(401) The Jazan slagger is not included as an asset in the Transaction. Nonetheless, the Notifying Party argues that the efficiencies related to the Jazan Slagger should be taken into account as the TSA is conditional upon completion of the Transaction and it would be terminated should the acquisition of Cristal's titanium dioxide business by Tronox not be completed. Therefore, absent the Transaction, the Jazan Slagger would not be brought into operation and the output increase would not take place.

(402) The Notifying Party is also in the process of finalising an option agreement to purchase the Jazan Slagger and this agreement would also be conditional upon completion of the Transaction.

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408 Reply to SO, paragraphs 629-635.

409 Reply to SO, Appendix F.

410 AMIC is the entity that holds and operates the Jazan Slagger and is jointly controlled by Tasnee and Cristal.

6.4.2.4. Reduction in variable costs

(403) Lastly, the Notifying Party submits that the Transaction would significantly reduce the merged entity's average variable costs by around [0-10]% within […]years.[411] The Notifying Party claims that these cost savings are merger-specific and would increase the merged entity's incentive to reduce prices for titanium dioxide pigment in order to increase sales. These cost savings are mainly associated with the expected improved performance of […]and the more efficient use of various other assets.

6.4.3. The Commission's assessment

6.4.3.1. Capacity expansion

(404) The Commission has not been able to conclude, on the basis of the information provided by the Notifying Party, that the Transaction would lead to a significant capacity expansion that would benefit EEA consumers or that any capacity expansion that may be achieved would necessarily be merger-specific.

6.4.3.1.1. Capacity expansion at Cristal's Yanbu plant

Verifiability

(405) The Notifying Party argues in the Efficiencies paper that Tronox would bring Yanbu up to its nameplate capacity of […]kt/y by […] by […].[412] The Notifying Party submits that Tronox's […] plants, which are based on the same technology, have consistently better […] than Yanbu, with the implication that what can be achieved at other Tronox plants can be replicated at Yanbu.

(406) The Commission has not, however, been able to conclude that these arguments suffice to demonstrate the verifiability of the claim. First, the Efficiencies paper does not set out the exact steps that Tronox would take to achieve this improvement. These steps were only mentioned in the Reply to the SO, *inter alia* by reference to documents produced shortly before the SO and after the Commission had raised serious doubts in relation to the Transaction.[413] The Efficiencies paper mainly refers to the due diligence assistance report prepared by […],[414][…] but without spelling out the improvements in question and explaining how they would translate into an increase in production capacity.[415]

(407) Second, the Notifying Party has not produced any evidence to show how the […] measures planned for Yanbu have been applied, and with what results, at its other plants. The internal documents on which the Notifying Party relies in the Reply to the SO[416] include more detailed information on the steps involved in […] and set out Tronox's overall estimates with respect to capacity expansion, but no explanation or evidence of the implementation of the same […] at other plants is provided, such as could substantiate these estimates. The additional information does not therefore make it possible to verify the Notifying Party's claim in relation to the Yanbu capacity expansion. The Commission also notes certain inconsistencies between the Efficiencies paper and the Reply to the SO. In particular, the Reply to the SO refers to […] as one of the main areas for improvement, whereas the Efficiencies paper,

411 These savings would be additional to any of the savings and efficiencies described in the previous sections.

412 Efficiencies paper, page 8.

413 Reply to SO, paragraph 600. Annex 12.21 to RFI 15, dated 9 February 2018.

414 Efficiencies paper, footnote 23, which also references Annex 12.21 to RFI 15, dated 9 February 2018.

415 […] (ID 698-000117),", January 30, 2017, slide 50.

416 Reply to SO, paragraph 597.

despite not providing any detail in this respect, mentions in a footnote that "[…]"[417] There are also inconsistencies between some of the internal documents put forward by the Notifying Party in support of the claimed efficiency. In particular, while its "[…]" spreadsheet of January 2017 envisaged an improved [parameter A] of [percentage a_1] and [parameter B]of [measure b_1] in 2021, the "[…]" of 9 February 2018 estimated 2021 [parameter A] at [percentage a_2 smaller than a_1] and [parameter B] of [measure b_2 greater than b_1]. While this may be the result of an improvement in the Parties' estimates over the course of one year, in the absence of explanations to this effect, the Commission cannot make this conclusion on behalf of the Parties and cannot therefore verify the efficiency claims submitted.

(408) Third, there is evidence to suggest that, despite the similarities between the […] and Yanbu plants in terms of, for example, their […], there are other factors which affect the performance of the plant and which may constitute serious obstacles to Tronox's plans to make improvements at Yanbu.

(409) In an email sent to several members of Tronox staff, […][418] This statement suggests that using the production rates achieved by Tronox at its […] plant is not a valid basis for estimating the improvement that could realistically be envisaged at Yanbu.

(410) There would appear to be a number of specific problems related to […] that are likely to make it very difficult for Tronox to […], and thus resolve all the problems. In its own due diligence report completed with a view to the Transaction, Tronox notes […].[419] The email (referred to above) sent by […] to Tronox also sets out in detail the consequences this could have for the operation of Yanbu. He highlights in particular that: i) […]; ii) […]; iii) […]; iv) […].

(411) It is clear from the examples given above that these are difficulties intrinsic to […], which would not be easily overcome simply as a result of the acquisition of Yanbu by Tronox.[420] Even if Tronox were assumed to have the necessary technical ability to increase capacity at Yanbu, it remains highly doubtful to what extent it would be able to make improvements in practice, given the considerable obstacles it would face.

(412) In the Response to the Letter of Facts, the Notifying Party submitted that the challenges posed by […] and […] can be overcome by offering […].[421] The Commission does not dispute that […] can improve […], but notes that – aside from raising merger-specificity issues which are further discussed in the following section – such measures take time to implement and their results are uncertain. They do not therefore dispel the doubts regarding Tronox's ability to bring Yanbu production to nameplate capacity, which has not been sufficiently substantiated by the Notifying Party.

(413) In conclusion, for the reasons set out above, the Commission considers that the capacity expansion claim for Yanbu has not been sufficiently verified.

Merger specificity

(414) The Commission is of the view that the Notifying Party has not sufficiently demonstrated that the acquisition of Cristal's titanium dioxide business by Tronox

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417 Efficiencies paper, footnote 30.

418 ID 1975-8698.

419 ID 2124-391.

420 The Notifying Party states that […]'s views are those of a Cristal employee, which Tronox does not necessarily endorse. […].

421 Reply to Letter of Facts, para 82.

would be the only way in which capacity could be increased at Yanbu. Moreover, there appear to be less anticompetitive, realistic and attainable alternatives for the Parties to expand capacity.

(415) First, the Commission notes that, immediately before the announcement of the Transaction, Cristal had […]. Moreover, it had […], had made […], and had […].

(416) Internal emails […] of Cristal staff at the end of 2016 show that Cristal had […].[422]Cristal was considering […].

(417) Subsequently,in January 2017, Cristal completed […]. On the basis of the conclusions from that exercise, it launched […] with the aim of […] in the short term, and achieving […] by the end of that year.[423] The Commission considers it irrelevant whether or not these plans were […] as the acquisition by Tronox was announced in February 2017.

(418) Second, evidence from internal documents also suggests that Cristal had been more […] than suggested by the information provided by the Notifying Party. The email sent from Cristal […], to Tronox (referred to in recital (409)) mentioned that "[…]."[424] The Commission therefore considers it likely that Cristal did in fact have the necessary technical expertise to increase the output of the plant, and that it was merely due to […] that higher output levels had not been maintained.

(419) Third, it is clear from the views expressed by […] in his email to Tronox that […]. Similarly, it is noted in Tronox's own due diligence on Yanbu that "[…]",[425] thus indicating that Cristal's […] is not related to […], but to […] – a problem which, if it can be resolved by Tronox ([…]) could equally be resolved by any other [..] purchaser.

(420) Fourth, the Notifying Party submits that even though […] may exist outside Tronox, this is not sufficient because "[…]."[426] In the Reply to the SO and the Response to the Letter of Facts, the Notifying Party submitted that the improvement in capacity at Yanbu would be achieved by applying the "Tronox Way", a set of operational excellence practices designed to improve output of its plants.[427]. The Notifying Party explained that it has designated […] to apply the "Tronox Way" and it submitted the draft "Yanbu Transformation" plan prepared by […].[428]

(421) The Commission does not dispute Tronox's operational excellence but it considers that the improvement claimed to result from the application of the "Tronox Way" cannot be verified. It is not clear, and the Notifying Party has not explained, how the application of the best practices entitled the "Tronox Way" can be reasonably expected to lead to an increase in production capacity of […]kt/y. The Commission also notes that the documents that allegedly illustrate the "Tronox Way" methodology and that were submitted by the Notifying Party in the Reply to the SO date from 2017 and 2018[429] and some of them appear to be still in draft form.[430] The

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422 ID 2355-30177.
423 ID 1975-5357.
424 ID 1975-8698.
425 ID 2124-391.
426 Reply to SO, paragraph 605.
427 Reply to SO, Annex 6.2.
428 Reply to Letter of Facts, Annex 10.
429 Reply to the SO, paragraph 626. The earliest of these is dated 16 March 2017 […], Reply to SO, Annex 6.7).
430 Annex 6.5. […].

Notifying Party claims that the application of […], but did not provide any evidence to substantiate these claims.[431] The Commission cannot therefore conclude that the application of the "Tronox Way" can lead to output increases at Yanbu that could not otherwise be achieved.

(422) In conclusion, for the reasons set out above, the Commission considers that the claim of capacity expansion at Yanbu does not meet the criterion of merger-specificity.

Benefit to EEA customers

(423) The arguments put forward by the Notifying Party do not demonstrate that a capacity expansion at Yanbu, even if this were to be achieved, would benefit EEA customers in the market for chloride-based titanium dioxide pigment for use in paper laminate.

(424) First, the Commission notes that the Yanbu plant does not currently produce a paper laminate grade. An increase in capacity at Yanbu could nonetheless have an effect on EEA customers of paper laminate grades if: (i) an increase in the production of grades currently produced at Yanbu were to free up capacity at the Parties' EEA plants where grades for use in paper laminate are produced, or (ii) post-Transaction, the merged entity were to start producing new grades at Yanbu.

(425) It is not clear that an increase in the production of grades currently produced at Yanbu would necessarily affect EEA customers that purchase paper laminate grades by increasing imports into the EEA and freeing up capacity at […], Cristal's EEA plant where paper laminate grades are produced. The only grade currently produced at […] is […], which accounts for less than […]% of Cristal's volumes sold in the EEA.[432] The only grade produced in Yanbu and sold in more significant quantities in the EEA […] is not, however, produced at any of Cristal's other plants, meaning that increasing production of this grade at Yanbu would not free up capacity elsewhere.

(426) Second, the Commission also considers that it is unclear whether an increase in capacity at Yanbu could benefit EEA customers indirectly by reducing exports from the EEA to the Middle East and Africa region, given that trade flows are currently modest, and the grades produced in the two regions are not necessarily interchangeable. It can be noted, in particular, that exports from the EEA to the Middle East and Africa (MEA) represented […]% of total EEA sales in 2017.[433] Only a very limited range of grades is produced at Yanbu, suggesting that increased production at Yanbu would be unlikely to replace the grades currently being exported. Even assuming this were possible, the current, modest level of exports from the EEA to MEA makes it difficult to conclude that a reduction in these exports would necessarily have a material effect on prices in the EEA. As regards the possibility of producing new grades at Yanbu, the Notifying Party has not provided any information regarding the costs and time associated with adapting Yanbu for the production of new grades (and, in particular, paper laminate grades), despite this question being raised by the Commission in the SO. In the Reply to the SO, the Notifying Party merely stated that it would […][434] but did not provide any details as

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431 The Notifying Party states that Tronox […], but it did not provide any evidence (such as contemporaneous internal reports) to support these claims or to explain how the application of the standards translated into concrete results.

432 Form CO, Annexes 6.2-21 and 6.2-27.

433 In the merger efficiencies paper submitted by the Notifying Party, the estimated total amount of titanium dioxide pigment exported from the EEA to the Middle East was […] kt in 2017, while the total volume sold in the EEA is expected to be […] kt in 2017 according to Annex 11 to RFI15.

434 Reply to SO, paragraph 616.

to how easily this could be done. Neither has the Notifying Party produced any evidence of its plans to produce new grades at Yanbu.

(427) Third, it is not clear whether the merged entity would have an incentive to produce a paper laminate grade at Yanbu as a result of its capacity expansion. In the Reply to the SO, the Notifying Party indicated its intention to […].[435][…].[436][…]. If an increase in capacity at Yanbu were to mainly serve to replace imports of plastics or coatings grades from plants located in other regions, it is unlikely that EEA customers purchasing paper laminate grades would benefit.

(428) Finally, the Commission also considers that the Notifying Party's claimed ability to increase effective capacity may not necessarily translate into higher levels of titanium dioxide pigment production. The Notifying Party refers to the capacity expansion undertaken by competitors such as Chemours and Lomon Billions and to the price increases seen between the third quarter of 2016 and the fourth quarter of 2017 (a period during which the Parties were producing at maximum capacity) and expected to continue in the future, as proof of its incentive to use its increased production capacity. There is also, however, evidence to suggest that the Parties may not always have had an incentive to use their full capacity. The Notifying Party explains that past instances of capacity curtailment, in particular of the measures taken in July 2015, were due to demand and prices being particularly low for an extended period of time, which led to excessive inventory levels. Public statements and internal documents produced by the Parties suggest, however, that they may be inclined to limit production even in periods where demand is increasing. In its investor call for the first quarter of 2016, for example, when demand had started to recover, Tronox's CEO indicated that "we don't intend to bring back the full production instantaneously simply because we could see the very first signs of price recovery. […] We understand balancing supply and demand is going to be an important part of that and we intend to be disciplined about it. So, no, I would not expect us to crash the market with bringing all that back shortly."[437] Likewise, a Cristal internal presentation […].[438][…]. The Commission therefore considers that, even if the merged entity were able to produce more titanium dioxide pigment at the Yanbu plant than Cristal would have been able to at the same point in time, there is not sufficient evidence to suggest that the merged entity would have a greater incentive to run at full capacity throughout the business cycle, including during upturn periods.

(429) In conclusion, for the reasons set out above, the Commission considers that the claim of capacity expansion at Yanbu is not sufficiently likely to benefit EEA customers of chloride-based titanium dioxide pigment for use in paper laminate.

6.4.3.1.2. Capacity expansion at other chloride-based plants

Verifiability

(430) The Commission considers that the […]% increase in output ([…]kt/y) by 2021 claimed by the Notifying Party is not sufficiently verifiable.

(431) First, the Notifying Party has not explained how the increase in output through the sharing of best practices is to be achieved. The documents on which the Notifying

435 Reply to SO, paragraph 617.
436 Annex 30A to RFI 11.
437 Annex 27-9 to the Notifying Party's reply to RFI 11.
438 ID 585-012116.

Party relies as evidence do not allow the Commission to verify that the efficiencies claimed are likely to materialise or that they would be substantial. In particular, the Excel spreadsheet prepared by Tronox to quantify the synergies from the merger lists a number of best practices and attributes an overall effect of [0-10]% increase in output to the Parties' plants (excluding […]). It does not, however, explain how each best practice is likely to increase output and, in particular, how this increase in output at the Parties' plants located in the EEA is likely to be achieved. For instance, the document lists […] among the best practice areas of improvement, but does not explain which of the Parties currently possesses the superior methods which could be implemented at the other's plants, or why the practices identified are likely to result in a substantial improvement in output. Moreover, some of the best practices seem to be relevant only for […].[439]

(432) Second, […][440][…].[441]

(433) In the Reply to the SO, the Notifying Party explained that it had developed a set of operational excellence standards entitled "the Tronox Way". The Notifying Party submits that it intends to fully implement the Tronox Way at […] in 2018 and at […] and […] as soon as the Transaction is completed, and it estimates that this is likely to increase production […] kt/y at […] and […] kt/y at […].[442]

(434) The Notifying Party does not explain whether and, if so, how the claimed increases of […]kt/y and […]kt/y at […] and […] respectively are connected to the increase of […]% resulting from the sharing of best practices. The Commission has therefore considered the […]kt/y increase as a separate efficiency claim although it does question why, if the Notifying Party considered this claim likely to materialise, it was not submitted earlier.

(435) As also explained in Section 6.4.3.1.1, the Commission considers that the increase in output claimed to result from the implementation of the "Tronox Way" cannot be verified. The Notifying Party has not submitted any evidence as to the results of the application of these quality standards at its other plants. It indicated that […], but it has not produced any assessment report or other type of internal document that could demonstrate that the increase in production is due to the implementation of the standards and not to other factors. Moreover, the Notifying Party has not put forward any explanation as to how it estimated the increases of […]kt/y and […]kt/y, respectively, at […] and […] . It has only submitted a letter from […] which mentions that these figures constitute the additional capacity which can be achieved in the EEA "with the implementation of […] and the merged assets of Cristal and Tronox" but without any accompanying explanation. This letter, dated 23 March 2018, appears to have been produced as a reaction to the SO (its subject line is "Response to Statement of Objections"). In light of its limited detail and the purpose for which it was produced, the Commission does not consider this letter to constitute relevant and convincing evidence in support of the Notifying Party's claim.

(436) In conclusion, for the reasons set out above, the Commission considers that the Notifying Party's claim in relation to a potential capacity increase at chloride-based plants other than Yanbu is not sufficiently verifiable.

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439 "Project […], Synergy Summary", sheet 54, ID 2124-002432.

440 […], ID 698-000117.

441 […], ID 698-000117.

442 Reply to SO, paragraphs 626-627.

Merger specificity

(437) The Commission also notes that, in addition to being insufficiently verifiable, part of the claimed increase in production does not appear to be merger-specific. In particular, given that the increase is claimed to arise as a result of the implementation of the "Tronox Way" standards, it is not clear how the merger could contribute to achieving the […]kt/y additional capacity at Tronox's own […] plant.

Benefit to EEA customers

(438) In the SO, the Commission noted that, with the exception of […], the plants in relation to which the Notifying Party claims efficiencies on the grounds of capacity expansion do not principally serve the EEA market and that, even assuming that […] individually benefited from the […]% increase cited by the Notifying Party, the total effective capacity increase at these plants would amount to less than […] kt/y. The Notifying Party has not provided any information on how increases in effective capacity at other plants would benefit EEA customers specifically.

(439) In the Reply to the SO, the Notifying Party submitted that the application of the "Tronox Way" would be likely to lead to production increases of […]kt/y at […] and […]kt/y at […].[443] However, the Notifying Party has not produced any evidence to substantiate this claim, which appears inconsistent with its previous arguments.

(440) The Commission cannot therefore conclude that capacity expansion at the Parties' other chloride-based plants (excluding Yanbu) would constitute an efficiency of benefit to the EEA market.

6.4.3.2. Increased production of titanium feedstocks and vertical integration

Verifiability

(441) The Notifying Party's estimates of the expected increase in feedstock production are based on a spreadsheet which, for the purpose of calculating the expected synergies arising from the Transaction, assumes an increase of […] titanium dioxide units and […] titanium dioxide units in, respectively, […].[444]

(442) No further documentation, internal analysis or other evidence has been provided to substantiate these estimates and therefore the Commission considers that the claimed increases in feedstock production are not sufficiently verifiable.

Merger-specificity

(443) The Notifying Party claims that, absent the Transaction, Tronox […]. This is because Tronox […] as, for strategic reasons, it prefers […].

(444) In the Commission's view, however, it is not clear why Tronox would not have the ability and incentive to increase feedstock production even absent the acquisition of Cristal's titanium dioxide business. The Commission notes that Cristal has been able to sell significant volumes of feedstock to competitors, […].[445]

(445) The Notifying Party argues that the "comparison with Cristal's sales does not prove that Tronox would be able to commercialize its excess synthetic rutile feedstock. […]."[446] The Commission disagrees with this view. The comparison with Cristal

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443 Reply to SO, paragraph 627.

444 ID 2124-565 (TRX-EC-00060383).

445 Cristal sold […] kt of chloride ilmenite and […]kt of leucoxene to […] in 2016. It had a market share of [20-30]% in chloride ilmenite ([…]) and [40-50]% in leucoxene ([…]).

446 Reply to SO, paragraph 650.

suggests that being active on the titanium dioxide pigment market is not, *per se*, a barrier to selling feedstocks to other pigment producers. Lacking any alternative explanation as to why […], the Commission considers that it cannot be excluded that, in the future, Tronox would try to increase feedstock sales to competitors, even absent the Transaction.

(446) In conclusion, for the reasons set out above, the Commission considers that the Notifying Party has not sufficiently substantiated its claim that the potential increase in production of titanium feedstock is merger-specific.

Benefit to EEA customers

(447) The Commission also questions whether the reduction in external demand for titanium feedstocks that may result from the Transaction would have a significant effect on the feedstocks market. Even according to the claims made by the Notifying Party, the decrease in feedstock demand would account for only […]% of the global market. Considering that, on the basis of the Notifying Party's estimates, the cost of feedstocks will account for less than […]% of the titanium dioxide pigment price in 2021, any effect on feedstock prices would be likely to be marginal.

(448) In the Reply to the SO, the Notifying Party reiterates that any cost reduction will benefit titanium dioxide customers worldwide as the market is global in scope. Furthermore, it argues that, even if the titanium dioxide pigment market were no wider than the EEA, the merged entity's plants and rival producers located in the EEA (or located outside the EEA but selling in the EEA) would benefit from the reduction in feedstock prices.[447]

(449) First, for the reasons set out in Section 6.2.2.1, the Commission considers the market for chloride-based titanium dioxide for use in paper laminate to be EEA-wide in scope.

(450) Second, the Notifying Party does not clarify how, and to what extent, an increase in feedstock production in […] would materially affect production costs at the Parties' titanium dioxide pigment plants in the EEA. No further documentation, internal analysis or other evidence has been provided to substantiate that the expected increase in feedstock production would benefit customers of titanium dioxide for use in paper laminate in the EEA.

(451) For the above-mentioned reasons, the Commission considers that the Notifying Party's claim in relation to potential increased production of titanium feedstocks is not sufficiently likely to benefit EEA customers.

6.4.3.3. Jazan Slagger

Merger specificity

(452) The Technical Service Agreement ("TSA") in which Tronox commits to offering specific services to assist AMIC in improving the performance of the Jazan Slagger is conditional upon the Option Agreement (see Section 6.4.2.3) as the termination of the Option Agreement would *ipso facto* lead to the termination of the TSA.[448] This implies that Tronox would not provide this technical assistance to AMIC if it did not have an option to buy the asset. Moreover, the Option Agreement stipulates that the Notifying Party could exercise its option to acquire the Jazan Slagger only if certain

447 Reply to SO, paragraph 658.

448 Reply to SO, paragraph 663.

conditions are fulfilled, including the Jazan Slagger achieving stated output levels. The TSA should therefore be seen as instrumental in bringing about the necessary improvements to performance that would ultimately trigger the acquisition of the Jazan Slagger. As a result, the Commission considers that the TSA and the possible future acquisition of the Jazan Slagger are intrinsically linked. As the Notifying Party claims that the acquisition of the Jazan Slagger is not part of the notified concentration, in the Commission's view, any synergies that may result from improvements to the slagger effected by Tronox cannot be taken into account in the assessment of the Transaction.

(453) In addition, the Commission considers that the Notifying Party has not sufficiently explained why this efficiency cannot be achieved via less anticompetitive alternatives. First, the Notifying Party claims that it would not assist AMIC absent the Transaction because Tronox would not benefit from the additional volume that could potentially be generated at the slagger. It is not, however, clear why Tronox could not obtain similar benefits by extracting value from the Technical Service Agreement on a commercial basis, particularly in view of the fact that, as the Notifying Party claims, only Tronox has the required expertise to address the problems encountered with the slagger and that there is no other producer interested in the business opportunity with similar expertise and operating capacity as Tronox.[449] Second, the Notifying Party claims that "it is improbable that […] competitors of Cristal's slagger, namely Rio Tinto (headquartered in the UK) and TiZir (headquartered in Norway) would ever help Cristal fixing its facility".[450] It did not, however, clarify whether it has approached these companies to verify whether they would be interested in providing technical assistance in relation to the slagger.

(454) In view of the above, the Commission concludes that the Notifying Party has not sufficiently demonstrated that the efficiency created from addressing problems at the Jazan Slagger is merger-specific.

Verifiability

(455) The Commission considers that, even assuming that any synergy resulting from Tronox resolving problems at the Jazan Slagger were to be taken into account in the assessment of the efficiencies, *quod non*, the efficiencies claimed in relation to Jazan Slagger are not verifiable as they are not sufficiently likely to arise.

(456) The Notifying Party's internal documents suggest that […].[451][…].

(457) The Commission therefore concludes that the efficiency claims relating to the Jazan Slagger are not sufficiently certain to be taken into consideration.

6.4.3.4. Reduction in variable costs

(458) The Notifying Party submits that the Transaction would allow the merged entity to save variable costs on […] different items and that together these savings would generate a reduction in variable costs of USD […] (which would represent a decrease of approximately [0-10]% in the merged entity's total variable costs).[452] Table 6 summarises the efficiencies claims relating to variable costs as submitted by the Notifying Party.

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449 Reply to SO, paragraph 675.
450 Reply to SO, paragraph 676.
451 RFI4, Annex 29.
452 Reply to SO, paragraph 686.

Table 6: Synergies claimed by the Notifying Party

Item	Synergy	Year 3 savings (USD million)
[…]	[…]	[…]
[…]	[…]	[…]
[…]	[…]	[…]
[…]	[…]	[…]
[…]	[…]	[…]
[…]	[…]	[…]
[…]	[…]	[…]
	[…]	[…]

Source: the Notifying Party "*Merger synergies will likely benefit EEA customers" (7 March 2018)*

(459) The Commission considers that the vast majority of the efficiencies relating to variable costs claimed by the Notifying Party are either not verifiable or it is unclear whether, and how, they would benefit EEA customers.

(460) The first three items listed in Table 6, which together account for [a substantial proportion]% (USD […]) of the expected reduction in variable costs, are plant-specific ([plant A], [plant B] and [plant C]). […].[453] The Notifying Party has not demonstrated how the reduction in variable costs at these plants would benefit EEA customers. In particular, the majority of the savings cited by the Notifying Party relate to [plant A], and, as explained above, it is not clear that any efficiencies achieved at the [plant A] plant would have any material impact on the EEA market. Similarly, the […] (one of the specific cost savings mentioned) seems to be mainly connected to Tronox's plant in […], and […] is exclusively relevant for Cristal's plant in […].

(461) For items 4, 6 and 7 in Table 6, which together account for […]% (USD […]) of the expected reduction in variable costs, the Notifying Party did not provide sufficiently detailed analysis or related documentation to allow the Commission to verify the magnitude of the reduction or the veracity of the underlying basis of the claims. The Notifying Party submitted a presentation prepared by an […],[454] but which cast doubts on the verifiability of the claimed efficiencies. […] considered these synergies as […] In relation to […] synergy, the largest saving in terms of absolute value (USD […] million), […] also noted that the estimate included

[453] In 2016, […] sold into the EEA, respectively, […]%,[…]% and […]% of their titanium dioxide production (source: Form CO, Annexes 6.2.34 and Annexes 6.2.35), which together accounted for approx. […]% of the EEA sales.

[454] Form CO, Annex 5.4-103.

USD […] million of […][455] and that "a probability factor of […]% is applied to the savings estimate to account for the lack of information regarding these synergies."[456]

(462) Overall therefore, of the USD […] million of synergies relating to variable costs claimed by the Notifying Party, for more than […]% (USD […] million) it is questionable whether EEA customers would benefit to any material extent and/or whether the synergies themselves are even sufficiently certain and verifiable to be taken into consideration. Even assuming that […] would materialise to the extent claimed by the Notifying Party (USD […] million), the impact on the merged entity's total variable costs would be minimal (less than […]%).

(463) In addition, some savings (e.g. […]) that would apply to several plants have been assessed by the Notifying Party at global level. Even if they were sufficiently certain and verifiable, it is unclear, as the Notifying Party has not explained, whether, and why, the calculated average savings per tonne would apply equally to all the Parties' plants.

(464) Finally, the Commission has doubts as to whether a meaningful proportion of the cost savings claimed by the Notifying Party (e.g. the […]) would be likely to be passed on to consumers, and thus that they would qualify as efficiencies under the Horizontal Merger Guidelines.[457] Specifically, certain cost savings appear to be based on […], but not on lower costs resulting from Transaction-specific productive synergies. Savings of this type do not improve the choice of suppliers available to consumers relative to the pre-merger situation, since consumers could also have purchased from the firm with lower costs absent the merger. Savings related to […] are not therefore capable of offsetting the anti-competitive effects of a horizontal merger, independently of the magnitude of the increase in concentration brought about by the merger.

6.4.3.5. Conclusion on efficiencies

(465) The Commission has not been able to reach a conclusion that the Transaction would create efficiencies of significant benefit to EEA customers on the market for chloride-based titanium dioxide pigment for use in paper laminate.

(466) The efficiencies claimed by the Notifying Party in relation to effective capacity expansion, increased production of feedstocks and reduction in variable costs do not meet the three cumulative criteria of verifiability, merger specificity and benefit to consumers set out in the Horizontal Merger Guidelines. Those criteria are required to be met for such claims to be taken into account in the Commission's assessment of the Transaction.

7. TITANIUM FEEDSTOCKS

7.1. Introduction

(467) Titanium feedstocks are titanium rich minerals extracted from mineral sands. They can be extracted using either a wet or a dry mining process, the choice usually

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455 The estimated […] amounted to USD […] in 2020, of which USD […] relates to savings in the purchase of various inputs (e.g. […].) and the remaining USD […] was 'unidentified'. A probability factor of […]% was applied to the total amount which produced an estimate of USD […] in expected savings for 2020 (source: ID 350-000049).

456 A probability factor of […]%,[…]% and […]% was applied to the savings expected in, respectively, 2019, 2020 and 2021 (source: ID 350-000049).

457 See also Commission Decision Case M.6905 - *INEOS / Solvay / JV*, paragraphs 1195 et seq.

depending on the nature of the mineral deposit. Titanium feedstocks are used in the manufacture of titanium dioxide pigment ([90-100]% of demand in 2016), titanium metal ([0-10]%) and other applications ([0-10]%, mostly welding electrodes[458]).

(468) The three main types of naturally occurring titanium feedstock are ilmenite, leucoxene and rutile. Ilmenite ($TiFeO_3$) has a titanium dioxide content of between [30-50]% and [50-70]% depending on the geological history of the deposit and the degree of oxidation of the iron, while rutile, which mainly consists of crystalline titanium dioxide (TiO_2) with minor impurities, has a titanium dioxide content of between [80-100]% and [80-100]%. Any intermediate natural alteration of ilmenite, with between [50-70]% and [80-100]% of titanium dioxide content, is called leucoxene. Unlike rutile or ilmenite, leucoxene does not constitute a distinct type of mineral but is the result of the natural weathering of ilmenite. Ilmenite can also be upgraded by industrial means ("beneficiated") to produce a number of synthetic titanium feedstocks, namely sulphate slag ([…]% titanium dioxide content), chloride slag ([…]%), slag fines ([…]%), upgraded slag (over […]%) and synthetic rutile ([…]%).

(469) Titanium feedstocks with lower titanium dioxide content are typically used in sulphate-based production of titanium dioxide pigment. These are primarily ilmenite with a titanium dioxide content below [40-60]% (known as sulphate ilmenite), sulphate slag and slag fines. Titanium feedstocks with higher titanium dioxide content are typically used in the chloride-based pigment production process. These include ilmenite with a titanium dioxide content above [50-70]% (known as chloride ilmenite), rutile, synthetic rutile, chloride slag, upgraded slag and leucoxene.

(470) The titanium metal industry uses primarily chloride slag (which accounts for just over half of titanium feedstock demand from this industry), but also some chloride ilmenite, rutile, upgraded slag and synthetic rutile. The welding industry uses mainly rutile and leucoxene, whilst there is also some demand for synthetic rutile and ilmenite (mainly sulphate ilmenite) from other industries.

7.2. Market definition

7.2.1. Product market definition

7.2.1.1. The Commission's past decisional practice

(471) In its one past case relating to titanium feedstocks, *Anglo American/Kumba Resources*,[459] the Commission considered the existence of separate markets for titanium feedstocks used in the chloride production process and titanium feedstocks used in the sulphate production process. Narrower product market definitions involving separate markets for each individual titanium feedstock were also considered. The product market definition was, however, left open.[460]

7.2.1.2. The Notifying Party's view

(472) The Notifying Party submits that there is one overall market for all titanium feedstocks. In its view, there is no basis for defining separate markets for individual titanium feedstocks, given the high level of demand-side substitutability in both titanium dioxide production and in the other industries in which titanium feedstocks are used. The Notifying Party also submits that there is some supply-side

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458 A welding electrode is a coated metal wire made of materials similar to the metal being welded.

459 Commission Decision Case M.3276 – *Anglo American/Kumba Resources*, 3 December 2003.

460 *Anglo American/Kumba Resources*, paragraphs 11-14.

substitutability in the titanium feedstocks market as there are a number of ways in which specific (lower grade) titanium feedstocks can be upgraded.

7.2.1.3. The Commission's assessment

(473) The Commission notes that substitutability between titanium feedstocks, both for use in titanium dioxide pigment production and in other areas, is likely to be more limited than claimed by the Notifying Party, but that most customers are nonetheless able to vary their usage to some extent. Whilst not all titanium dioxide pigment producers are able to use an equally wide a range of titanium feedstocks, and the choice of titanium feedstocks is likely to be more restricted for customers in other areas, such as welding electrode fluxes, there is clearly some demand-side substitutability. Supply-side substitutability is, however, very limited.

(474) First, the Commission notes that the titanium feedstocks used in chloride- and sulphate-based titanium dioxide pigment production, respectively, are generally quite distinct. Suppliers of titanium feedstocks stated that chloride-based titanium dioxide pigment plants can typically only use titanium feedstocks with a minimum of around 85% titanium dioxide content.[461]

(475) Second, the Commission observes that there is a certain level of demand-side substitutability between the various different titanium feedstocks used in chloride-based production and, separately, between the different titanium feedstocks used in sulphate-based production.[462]

(476) Third, responses to the market investigation generally confirmed that switching to lower-grade titanium feedstocks could create additional costs (as a result of higher volumes of waste, lower output rates and possible reductions to a particular plant's capacity).[463]

(477) Fourth, in relation to the welding electrodes industry, the results of the market investigation generally confirm that customers in this sector tend to need high-grade titanium feedstocks, with a high proportion of titanium dioxide.[464] This is reflected by the fact that, as a proportion of the welding electrode industry's total titanium feedstocks consumption, natural rutile accounted for [90-100]% and leucoxene for [0-10]% in 2016.[465] Both suppliers of titanium feedstocks and producers of welding electrodes (in other words, their customers) indicated that, at least for some applications within welding electrodes, customers in this sector can only use titanium feedstocks with a *very* high titanium dioxide content.[466] Titanium feedstock suppliers also explained that it is particularly important for the welding electrodes industry that the level of sulphur and phosphorous is very low. The reason for this is that too much phosphorous can make the welds brittle, leading to quality and safety issues.[467]

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461 Questionnaire 4 to competitors in zircon and feedstocks, Q25.

462 The exact titanium feedstocks that can be used vary between plants, and some producers have more flexibility than others. Chemours is able to use lower-grade feedstocks in its chloride-based production than are other suppliers, as it has a different waste disposal system, which means that it can deal with the output from higher levels of impurities more cheaply than other competitors.

463 Questionnaire 4 to competitors in zircon and feedstocks, Q28. Questionnaire 2 to titanium dioxide competitors, Q103.

464 Questionnaire 4 to competitors in zircon and feedstocks, Q23.

465 Form CO, Annex 6.2-8.

466 Questionnaire 4 to competitors in zircon and feedstocks, Q25. Questionnaire 5 to feedstocks customers, Q16.

467 Minutes of call with feedstocks competitor, 18 August 2017, 16.00, ID 1644.
Questionnaire 4 to competitors in zircon and feedstocks, Q25, Q26.

(478) Lastly, with respect to supply-side substitutability, the results of the market investigation suggest that this is far more limited than claimed by the Notifying Party. Suppliers of titanium feedstocks indicated that it is not easy to upgrade or change the types of titanium feedstocks they sell, the properties being largely determined by the geology of the mine. They explained that, even where some upgrading would technically be possible, it would not be economically viable.[468] The Commission notes that upgrading titanium feedstocks requires a specific type of slagging facility. Contrary to the Notifying Party's claims, supply-side substitutability would therefore appear to be very limited.

7.2.1.4. Conclusion on the product market definition for titanium feedstocks

(479) For the purposes of this case, the exact product market definition for titanium feedstocks can, in any case, be left open as the Transaction does not create competition concerns on markets for titanium feedstocks under any of the plausible product market definitions (see Section 7.3.), whether a single product market for all titanium feedstocks, separate product markets for chloride and sulphate titanium feedstocks, or individual product markets for individual titanium feedstocks (such as natural rutile, leucoxene or chloride ilmenite).

7.2.2. Geographic market definition

7.2.2.1. The Commission's past decisional practice

(480) In its one previous Decision relating to markets for titanium feedstocks, *Anglo American/Kumba Resources*, the Commission left the geographic market definition open, and considered market shares on both an EEA and a global level.[469]

7.2.2.2. The Notifying Party's view

(481) The Notifying Party submits that the market for titanium feedstocks should be considered to be global. The main reason put forward is that the mines from which titanium feedstocks are sourced are located predominantly in Australia, South Africa and Brazil (in addition to a number of other locations mainly in Asia and Africa), and that the mining companies supply customers worldwide from these locations. The Notifying Party also argues that titanium dioxide pigment producers located in the EEA source titanium feedstocks on a global basis.

7.2.2.3. The Commission's assessment

(482) The responses to the market investigation generally confirmed the Notifying Party's claim that titanium feedstock suppliers serve customers worldwide, or at least over a large geographic area.[470] Competitors also reported that import duties and regulations do not constitute a barrier to importing titanium feedstocks into the EEA.[471]

(483) In addition, the majority of titanium feedstock suppliers were of the opinion that prices are fairly similar worldwide,[472] although several respondents did note that there is often a difference between China and the rest of the world due to differences in the nature of the markets. Sales of titanium feedstocks in China are made almost

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468 Questionnaire 4 to competitors in zircon and feedstocks, Q21.

469 Commission Decision Case M.3276 – *Anglo American / Kumba Resources*, 3 December 2003, paragraphs 16-17.

470 Questionnaire 4 to competitors in zircon and feedstocks, Q37.

471 Questionnaire 4 to competitors in zircon and feedstocks, Q40.

472 Questionnaire 4 to competitors in zircon and feedstocks, Q39, Q42.

exclusively on a spot basis, whereas in other regions customers (notably pigment producers) fix prices for at least six months.[473]

(484) In addition, the location of titanium feedstock mines is not a decisive factor in most titanium pigment producers' choice of supplier.[474] Pigment producers are more likely to choose on the basis of the quality of the titanium feedstock and the overall price.[475]

(485) From a supplier's perspective, transport costs are also not generally considered to be an important factor in the price of titanium feedstocks, although views on this were mixed.[476] The percentage of the price that is accounted for by transport costs appears to vary significantly, from around 5% up to as much as 25%, depending on the specific titanium feedstock and the regions being delivered to.[477]

(486) Responses to the market investigation also suggested that customer preferences in industries other than titanium dioxide pigment production may vary between regions. In the welding electrodes industry, for example, customers in South America and Asia are known to use titanium feedstocks with lower levels of titanium dioxide compared to that used by welders in the United States.[478] Producers of titanium metals located in Japan are similarly thought to have particularly high quality requirements, as they produce high-end products.[479]

7.2.2.4. Conclusion on geographic market definition for titanium feedstocks

(487) For the purposes of this case, the exact geographic market definition for titanium feedstocks can, in any case, be left open between either an EEA market or a wider-than-EEA market as the Transaction does not create competition concerns under any plausible geographic market definition.

7.3. Competitive assessment

7.3.1. Horizontal effects

7.3.1.1. Introduction

(488) Both Tronox and Cristal are active in the mining of titanium feedstocks, which they largely use internally for the production of titanium dioxide pigment but which they also sell on the merchant market.

(489) More specifically, Tronox is the most vertically integrated of the titanium dioxide pigment producers and mines […]. It therefore sells some titanium feedstocks to other titanium dioxide pigment producers and to other industries. In 2016, it sold around […]% of its total titanium feedstock production. Cristal is also vertically integrated to a certain extent, […]. At the same time, however, it also sells significant volumes of its own titanium feedstocks. […].[480] In 2016, it sold around […]% of its total titanium feedstock production.

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473 Questionnaire 4 to competitors in zircon and feedstocks, Q39.

474 Questionnaire 2 to titanium dioxide competitors, Q106.

475 Minutes of call with titanium pigment producer, 31 August 2017, 10.00, ID 2602.

476 Questionnaire 4 to competitors in zircon and feedstocks, Q44.

477 Questionnaire 4 to competitors in zircon and feedstocks, Q44.

478 Minutes of call with feedstocks competitor, 18 August 2017, 16.00, ID 1644.

479 Minutes of call with feedstocks competitor , 17 August 2017, 10.00, ID 1544.

480 Cristal purchases chloride titanium feedstocks (leucoxene, rutile, synthetic rutile, chloride slag and upgraded slag) and sulphate slag. It also sells sulphate ilmenite, chloride ilmenite, leucoxene and rutile. This is because: […].

(490) The Parties' activities in titanium feedstocks do not give rise to affected markets in the EEA under any plausible product market definition. On the assumption of a global geographic market, the Commission has identified as affected markets[481] the global market for chloride titanium feedstocks and three sub-markets of that market, namely (i) the global market for chloride ilmenite, (ii) the global market for natural rutile and (iii) the global market for leucoxene.[482] Only these four plausible global markets are therefore discussed in the following sections.

7.3.1.2. Global market for chloride titanium feedstocks

(491) In 2016, chloride titanium feedstocks (in other words, those typically used in chloride-based titanium dioxide pigment production, as opposed to sulphate-based titanium dioxide pigment production) represented [40-50]% of the total titanium feedstock market.[483]

(492) The main chloride titanium feedstocks are chloride slag ([30-40]% of the chloride titanium feedstock market), natural rutile ([20-30]%), chloride ilmenite ([20-30]%), synthetic rutile ([0-10]%), upgraded slag ([0-10]%) and leucoxene ([0-10]%).

(493) Table 7 shows the Parties' and their competitors' market shares at both production and external sales levels, on the global market for chloride titanium feedstocks over the period 2014-2016.[484]

481 On the basis of either sales and/or production volumes.

482 Based on 'M8451_Annex 7-1_Feedstock Sales Market Shares per feedstock.XLSX'.

483 Based on 'M8451_Annex 7-1_Feedstock Sales Market Shares per feedstock.XLSX'.

484 As the individual titanium feedstocks each have a different titanium dioxide content, ranging from 42% to 96%, production and market share figures are typically measured in thousands of titanium dioxide units.

Table 7 – Production and market share figures for the global market for chloride titanium feedstocks over the period 2014-2016

Global market	2014		2015		2016	
	Production	External sales	Production	External sales	Production	External sales
TOTAL market size (in '000 TiO_2 units)	[…]	[…]	[…]	[…]	[…]	[…]
Tronox	[20-30]%	[0-5]%	[20-30]%	[5-10]%	[10-20]%	[0-5]%
Cristal	[10-20]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%
Combined	**[30-40]%**	**[10-20]%**	**[20-30]%**	**[10-20]%**	**[20-30]%**	**[10-20]%**
Rio Tinto	[30-40]%	[40-50]%	[20-30]%	[30-40]%	[20-30]%	[30-40]%
Iluka	[5-10]%	[10-20]%	[10-20]%	[10-20]%	[5-10]%	[10-20]%
Kenmare	[5-10]%	[5-10]%	[0-5]%	[5-10]%	[0-5]%	[5-10]%
Tizir	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[5-10]%
Base Resources	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Sierra Rutile	[0-5]%	[5-10]%	[0-5]%	[5-10]%	[0-5]%	[5-10]%
Group DF	[0-5]%	[5-10]%	[0-5]%	[5-10]%	[0-5]%	[5-10]%
Sibelco	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Others	[10-20]%	[5-10]%	[20-30]%	[10-20]%	[20-30]%	[10-20]%

Source: Based on file 'M.8451 - RFI4 - Annex 3 - Chloride Sulphate Global Sales and Production Shares - update.xlsx' and 'Update of Annex 4 of RFI15.xlsx'.

(494) As can be seen from Table 7, the Parties had a combined market share of [20-30]% (at production level) in 2016 in the global market for chloride titanium feedstocks. Together, however, the Parties only sell around […] of the chloride titanium feedstocks they produce. Their position on the merchant market therefore remains fairly limited, with a combined market share of [10-20]% in 2016. In terms of external sales, Rio Tinto would remain the leading market player by some distance, based on its market share of [30-40]% in 2016, and Iluka would have external sales comparable to those of the merged entity (based on its market share of [10-20]% in 2016). There are also a large number of smaller suppliers that would have market shares of up to [5-10]%, including Kenmare, TiZir, Base Resources, Sierra Rutile and Group DF. Customers would therefore still have a wide range of suppliers to choose from, who would continue to exert competitive pressure on the merged entity.

(495) Although the merged entity would be the largest producer of chloride titanium feedstocks, there would still be a number of other strong actors on the production market, including Rio Tinto (which had a production share of [20-30]% in 2016, thus very similar to the Parties' combined production share of [20-30]%), followed by Iluka, with [5-10]%. The remainder of the market is occupied by a larger number of smaller competitors (including, in addition to those identified in Table 7, Doral, DCW, UKTMC, Southern Ionics, MZI Resources and Mineral Deposits), none of which has an individual production share of more than [5-10]%.

(496) Responses to the market investigation confirmed that the quality and specific characteristics of chloride titanium feedstocks are almost entirely determined by the geology of the mine. In particular, particle size and levels of impurities will depend on the geographic location of the mine.[485] In view of this, mines that are located close to one another are more likely to have similar chloride titanium feedstocks, and the majority of competitors considered that, as a natural consequence of this, they are

485 Questionnaire 4 to competitors in zircon and feedstocks, Q64.

more likely to compete with chloride titanium feedstocks producers that have mines close to their own.[486]

(497) Tronox has mines in South Africa and south-western Australia while Cristal has mines in south-western and south-eastern Australia and in Brazil. A number of other competitors also, however, have mines in Australia (including in western Australia), thus confirming that the location of the Parties' mines does not of itself make them closer competitors than either one of them is to other suppliers present in the same area. Iluka has mines in western, southern and eastern Australia, MZI Resources has a mine in western Australia and Sibelco has a mine in north-eastern Australia.

(498) The lack of any particular closeness of competition between the Parties is also confirmed by responses to the market investigation. Competitors active in the production of chloride titanium feedstocks considered Rio Tinto, TiZir and Iluka to provide feedstocks that are most similar to those of Tronox (whilst Cristal was not mentioned at all). Cristal's feedstocks were generally regarded as most similar to those of Iluka, with Kenmare, Doral and Ukrainian suppliers also mentioned by one respondent as offering a similar grade of ilmenite. Tronox was not mentioned by any respondent.[487]

(499) Whilst the Transaction would inevitably lead to the removal of one supplier of chloride titanium feedstocks, neither Cristal nor Tronox would appear to be regarded as a critical supplier. One competitor referred to there being a "moderate reduction in customers' options to choose suppliers" whilst another said the impact would be "minimal".[488]

(500) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition on the global market for chloride titanium feedstocks as a result of horizontal effects.

7.3.1.3. Global market for chloride ilmenite

(501) In 2016, chloride ilmenite represented [0-10]% of the total titanium feedstock market.[489] Table 8 shows the Parties' and their competitors' market shares at both production and external sales level, on the global market for chloride ilmenite over the period 2014-2016.

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486 Questionnaire 4 to competitors in zircon and feedstocks, Q64.

487 Questionnaire 4 to competitors in zircon and feedstocks, Q65.

488 Questionnaire 4 to competitors in zircon and feedstocks, Q82.1.

489 Based on 'M8451_Annex 7-1_Feedstock Sales Market Shares per feedstock.XLSX'.

Table 8 – Production and market share figures for the global market for chloride ilmenite over the period 2014-2016

Global market	2014		2015		2016	
	Production	External sales	Production	External sales	Production	External sales
TOTAL market size (in '000 TiO_2 units)	[…]	[…]	[…]	[…]	[…]	[…]
Tronox	[20-30]%	[0-5]%	[10-20]%	[0-5]%	[10-20]%	[5-10]%
Cristal	[20-30]%	[40-50]%	[10-20]%	[20-30]%	[10-20]%	[20-30]%
Combined	**[40-50]%**	**[40-50]%**	**[30-40]%**	**[30-40]%**	**[20-30]%**	**[30-40]%**
Rio Tinto	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[5-10]%	[10-20]%
Iluka	[10-20]%	[10-20]%	[10-20]%	[5-10]%	[0-5]%	[5-10]%
Kenmare	[10-20]%	[20-30]%	[10-20]%	[10-20]%	[10-20]%	[20-30]%
Tizir	[0-5]%	[0-5]%	[5-10]%	[10-20]%	[5-10]%	[10-20]%
Sierra Rutile	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Group DF	[5-10]%	[10-20]%	[0-5]%	[5-10]%	[0-5]%	[5-10]%
Doral	[0-5]%	[5-10]%	[0-5]%	[5-10]%	[0-5]%	[0-5]%
Others	[10-20]%	[0-5]%	[30-40]%	[10-20]%	[40-50]%	[10-20]%

Source: Based on Annex 7-2 and the updated version of Annex 7-8 to the Form CO.

(502) On the basis of 2016 market shares, the Parties have a combined market share of [30-40]% in sales, with an increment of [5-10]% brought by Tronox. Both from a production and sales perspective, the merged entity would become the largest player in the market for chloride ilmenite, followed by Kenmare ([20-30]% in sales), Rio Tinto and TiZir (both [10-20]%). There would, however, remain a number of other competitors active, including significant players in titanium feedstocks such as Group DF and Iluka.

(503) Tronox and Cristal have each sold chloride ilmenite to different customers. Tronox sold […]. Similarly, […]. As such, […].

(504) More specifically, the Notifying Party submits […]. According to the Notifying Party, this was an opportunistic, one-off decision, and Tronox […].

(505) In addition, it should be noted that chloride ilmenite is the lowest quality of the chloride titanium feedstocks. With the exception of Chemours, suppliers of chloride-based titanium dioxide pigment can only use limited amounts of chloride ilmenite. As a result, a significant proportion of chloride ilmenite (over [30-60]% of total supply in 2016) is upgraded rather than being used directly.[490]

(506) The Commission therefore considers that, even if chloride ilmenite is considered to form a separate market, there would be significant competitive pressure from neighbouring markets, namely from other chloride titanium feedstocks which have higher titanium dioxide content and generally perform better in the production of titanium dioxide pigment as they lead to lower quantities of waste. Were the price of chloride ilmenite to rise, the cost advantage at the point of purchasing chloride ilmenite relative to other chloride titanium feedstocks would therefore no longer be sufficient to outweigh the lower production rates and the additional costs created by waste disposal.

(507) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition on the global market for chloride ilmenite as a result of horizontal effects.

490 Form CO, Annex 7-5.

7.3.1.4. Global market for natural rutile

(508) In 2016, natural rutile represented [10-20]% of the total titanium feedstock market.[491] Table 9 shows the Parties' and their competitors' market shares at both production and external sales levels, on the global market for natural rutile over the period 2014-2016.

Table 9 – Production and market share figures for the global market for natural rutile over the period 2014-2016

Global market	2014		2015		2016	
	Production	External sales	Production	External sales	Production	External sales
TOTAL market size (in '000 TiO_2 units)	[…]	[…]	[…]	[…]	[…]	[…]
Tronox	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%
Cristal	[10-20]%	[0-5]% (*)	[10-20]%	[0-5]% (*)	[10-20]%	[0-5]% (*)
Combined	**[20-30]%**	**[5-10]%**	**[20-30]%**	**[5-10]%**	**[20-30]%**	**[5-10]%**
Rio Tinto	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[10-20]%
Iluka	[20-30]%	[20-30]%	[10-20]%	[20-30]%	[10-20]%	[10-20]%
Sibelco	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%
Tizir	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Sierra Rutile	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[20-30]%
Group DF	[5-10]%	[10-20]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%
Base Resources	[5-10]%	[5-10]%	[10-20]%	[10-20]%	[10-20]%	[10-20]%
Others	[5-10]%	[5-10]%	[5-10]%	[10-20]%	[10-20]%	[20-30]%

Source: Based on updated versions of Annex 7-8 and Annex 7-3 to the Form CO. (*) […].

(509) Both Tronox and Cristal sell natural rutile mainly to traders, which then sell on to customers in the welding electrodes and glass industries.

(510) The market for natural rutile is only an affected market at the production level in 2014 to 2016, and only marginally, the Parties having a combined market share of [20-30]% in 2016, with an increment of [5-10]% brought by Tronox. While the Parties would become the largest global producer of natural rutile, the second largest producer, Sierra Rutile, would have […] market share ([10-20]% relative to the merged entity's [20-30]%, based on 2016 figures) and their combined share on the merchant market would be very modest, at only [5-10]% in 2016. A number of significant competitors would remain active on the market, including Sierra Rutile ([20-30]% market share in sales), Iluka ([10-20]%), Base Resources ([10-20]%) and Rio Tinto ([10-20]%). Group DF and Sibelco would also have market shares of more than [5-10]%.

(511) The likelihood of the merged entity being able to exercise any market power on this fragmented market therefore seems very limited, even taking into account the Parties' stronger position in production relative to sales and their ability as a consequence to bring a larger volume onto the market.

(512) A small number of market participants expressed the view that Tronox's, and to a lesser extent Cristal's, rutile is of particularly high quality and has low levels of phosphorous,[492] making it particularly suitable for use in high-end welding electrodes.[493] [494] Although the quality requirements of this industry mean that not all

491 Based on 'M8451_Annex 7-1_Feedstock Sales Market Shares per feedstock.XLSX'.

492 Minutes of call with feedstocks supplier, 18 August 2017, 16.00, ID 1644.

493 Rutile is defined as titanium feedstocks with titanium content of at least [80-100]%, but customers in these industries typically require at least [80-100]% titanium content, and sometimes even higher.

types of rutile are suitable, the results of the market investigation indicate that customers still have sufficient alternatives, with suppliers such as Sibelco, VW Mineral and Trimex also supplying a high quality product.[495] Furthermore, the market investigation did not suggest that market participants are concerned about the effects that the Transaction could have on competition on this market.

(513) Only one respondent to the market investigation, active as a trader in welding electrode fluxes, appeared concerned, stating that the Transaction would have "a big influence [on prices] due to less competition for rutile and leucoxene"[496] and that on the market for rutile there would be "less choice for supplier to welding material".[497] The Commission considers, however, that this customer's concern is not justified. First, as mentioned above, there are a wide range of alternative suppliers of rutile, including several offering high quality rutile. Second, when listing the five largest suppliers of rutile, this customer only placed Cristal third and did not include Tronox at all in the top five.[498] Furthermore, Tronox did not appear to have any sales to this customer in 2016.[499] Lastly, the customer has no activity relating to titanium feedstocks in the EEA.

(514) For the reasons given in this Section, and in particular Cristal's very low sales volumes and the Parties' modest combined market share even in production, the Commission considers that the Transaction is unlikely to have any significant effect on competitive dynamics, even taking into account potential product differentiation and the specific requirements of customers in sectors other than titanium dioxide pigment production.

(515) The Commission therefore concludes that the Transaction does not significantly impede effective competition on the global market for natural rutile as a result of horizontal effects.

7.3.1.5. Global market for leucoxene

(516) In 2016, leucoxene represented [0-10]% of the total titanium feedstock market.[500] Table 10 shows the Parties' and their competitors' market shares in terms of both production and external sales, on the global market for leucoxene over the period 2014-2016.

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494 Minutes of call with feedstocks supplier, 16 August 2017, 11.00, ID 1335. Minutes of call with feedstocks supplier, 18 August, 16.00, ID1644.

495 Minutes of call with feedstocks supplier, 18 August 2017, 16.00, ID 1644.

496 Questionnaire 5 to titanium feedstocks customers, Q61.7.

497 Questionnaire 5 to titanium feedstocks customers, Q61.3.

498 Questionnaire 5 to titanium feedstocks customers, Q39.

499 Annex 32A to RFI4 (2016 sales).

500 Based on 'M8451_Annex 7-1_Feedstock Sales Market Shares per feedstock.XLSX'.

Table 10 – Production and market share figures for the global market for leucoxene over the period 2014-2016

Global market	2014		2015		2016	
	Production	External sales	Production	External sales	Production	External sales
TOTAL market size (in '000 TiO_2 units)	[…]	[…]	[…]	[…]	[…]	[…]
Tronox	[20-30]%	[5-10]%	[20-30]%	[0-5]%	[10-20]%	[5-10]%
Cristal	[50-60]%	[70-80]%	[40-50]%	[70-80]%	[30-40]%	[40-50]%
Combined	**[70-80]%**	**[70-80]%**	**[60-70]%**	**[80-90]%**	**[50-60]%**	**[50-60]%**
MZI Resources	[0-5]%	[0-5]%	[0-5]%	[5-10]%	[20-30]%	[30-40]%
Southern Ionics	[0-5]%	[0-5]%	[0-5]%	[5-10]%	[5-10]%	[10-20]%
Doral	[5-10]%	[10-20]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Mineral Deposits	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Others	[10-20]%	[10-20]%	[20-30]%	[0-5]%	[5-10]%	[0-5]%

Source: Based on the updated version of Annex 7-3 to the Form CO.

(517) In terms of external sales, the Parties had a combined market share of [50-60]% in the market for leucoxene in 2016, with an increment of [5-10]% brought by Tronox. The combined market share was similar on the production market, at [50-60]%, with an increment of [10-20]% brought by Tronox. MZI Resources would be the merged entity's main competitor, with a market share of [20-30]% in production and [30-40]% in sales. There is one other significant actor on this market, Southern Ionics, whose market share was [5-10]% in production and [10-20]% in sales in 2016.

(518) Given the very limited size of the market for leucoxene, market shares can significantly vary from one year to another, depending on contract deadlines, natural depletion of resources and the opening of new mines. The total market size is estimated to have doubled between 2015 and 2016, for example, while Cristal's market share fell […]. Similarly, MZI Resources was able to capture [30-40]% of the market in 2016, despite having only entered in 2015.

(519) Tronox has sold […].

(520) The Parties do not appear to be close competitors in the global market for leucoxene because Tronox's leucoxene is a 'high end' leucoxene and Cristal's is mainly 'low-end'. Leucoxene can vary significantly in quality, having a titanium dioxide content ranging from 65% to 92%. Tronox's leucoxene is at the very top of this range, with […] titanium dioxide content, while […] of Cristal's leucoxene is of much lower quality.

(521) The level of titanium dioxide content is the reason why Tronox's leucoxene is suitable for use in the welding electrodes industry. The […] (around […]%) of the leucoxene produced by Cristal has titanium content of […]%, meaning it cannot be used by the welding electrodes industry. This leucoxene is therefore sold to […]. Only the remaining […]% of Cristal's leucoxene, which is of higher quality (with […]% titanium dioxide content), is sold to […] and directly competes with leucoxene supplied by Tronox. In addition, as Tronox […], the Parties' activities in sales of leucoxene to this industry do not overlap.

(522) Furthermore, the results of the market investigation indicated that customers currently purchasing this type of high-grade leucoxene would still have sufficient choice of alternative products following the Transaction. MZI Resources produces a high-grade leucoxene (88% titanium dioxide content) and Iluka produces a rutile-ilmenite blend, which replicates the titanium dioxide content of high-grade

leucoxene, called HyTi90 (which has 90% titanium dioxide content) and which would be suitable for use by the welding electrodes industry.[501] Although Iluka's HyTi90 is not technically a leucoxene and therefore does not appear in the estimated market shares, its percentage titanium dioxide content is equivalent to that of a high-grade leucoxene, such as that sold by the Parties. This, therefore, suggests that, even considering high-grade leucoxene, the merged entity would not be the only option available to customers, as both MZI Resources[502] and Iluka offer similar products and would continue to exert competitive pressure.[503]

(523) Moreover, given that leucoxene has lower titanium dioxide content and higher levels of impurities than rutile,[504] customers that currently use leucoxene are technically able to use natural rutile instead. The merged entity's ability to increase prices would be limited by the pressure from the neighbouring market for natural rutile, given that customers could switch to using natural rutile if leucoxene no longer offered a price advantage. It should be noted, in particular, that sales of natural rutile to welding electrodes customers were significantly higher than those of leucoxene ([…] titanium dioxide units of rutile in 2016 compared with […] of leucoxene).

(524) It therefore appears unlikely that the Transaction would lead to a significant reduction in competition on the global market for leucoxene, given in particular the significant competitive pressure that would be exerted by the neighbouring market for natural rutile, and the availability of natural rutile/ilmenite blends that would also compete with higher-grade leucoxene used in the welding electrodes industry.

(525) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition on the global market for leucoxene.

7.3.1.6. Conclusion of horizontal effects on titanium feedstocks

(526) The Commission concludes that the Transaction would be unlikely to significantly impede effective competition on the titanium feedstocks markets, irrespective of the exact market definition applied.

7.3.2. Vertical effects between titanium feedstocks and titanium dioxide pigments

(527) The Transaction creates several vertical links as both Parties are active in the downstream market for titanium dioxide pigment and in the upstream market for titanium feedstocks. As the Parties' combined market shares are above [30-40]% on the downstream EEA market for chloride-based titanium dioxide pigment for use in paper laminate and on the upstream global markets for chloride ilmenite and leucoxene, the following relationships are vertically affected and have been analysed by the Commission: (i) the downstream EEA market for chloride-based titanium dioxide pigment for use in paper laminate and the various possible upstream markets for chloride titanium feedstocks; (ii) the upstream global market for chloride ilmenite and the various possible downstream titanium dioxide pigment markets; and (iii) the

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501 Questionnaire 4 to competitors in zircon and feedstocks, Q20. Minutes of call with feedstocks producer, 16 August 2017, 11.00, ID 1335.

502 MZI Resources does not currently sell to any customers in the welding electrodes sector but is considering doing so.

503 Only one (non-EEA) customer expressed concern about the effect of the Transaction on the market for leucoxene for use in welding electrodes. This customer is concerned that leucoxene would be used internally by the merged entity rather than being sold, but does not further substantiate its concerns or indicate that there are no other potential suppliers of leucoxene or that other products, such as Iluka's HyTi90 or rutile, could not be used.

504 Minutes of call with feedstocks supplier, 18 August, 16.00, ID 1644.

upstream global market for leucoxene and the various possible downstream titanium dioxide pigment markets.

7.3.2.1. Vertical links between chloride-based titanium dioxide pigment for use in paper laminate and chloride titanium feedstocks

(528) The Transaction creates a vertically affected link between the downstream EEA market for chloride-based titanium dioxide pigment for use in paper laminate, where the Parties' combined market share was [30-40]% in 2016, and the upstream market for chloride titanium feedstocks,[505] where the Parties had a combined market share of [10-20]% at global level and [5-10]% at EEA level in 2016.[506]

(529) The Commission considers that, post-Transaction, the merged entity would, however, not have the ability to foreclose upstream competitors' access to downstream markets for selling chloride titanium feedstocks. Despite the Parties' market power in the downstream market for chloride-based titanium dioxide pigment for use in paper laminate, considering all purchases of chloride titanium feedstocks, the Parties' position as customers is modest and suppliers of chloride titanium feedstocks would still have a wide range of other customers, including manufacturers of chloride-based titanium dioxide pigment for use in coatings and plastics.

(530) Moreover, given that chloride-based titanium dioxide pigment for use in paper laminate accounts for less than [0-10]% of total titanium dioxide pigment production in the EEA and less than [0-10]% in the global market, the downstream EEA market for chloride-based titanium dioxide pigment for use in paper laminate in general, and the merged entity's activity in this market in particular, would not constitute an important downstream customer base for chloride titanium feedstocks[507] and the merged entity would not therefore be in a position to significantly impede effective competition by foreclosing its upstream competitors on the market for chloride titanium feedstocks.

(531) The fact that both Tronox and Cristal are already (at varying extents) vertically integrated with respect to the upstream market for titanium feedstock mining means that they do not account for as significant a proportion of purchases of titanium feedstocks as their market shares on the market for titanium dioxide pigment would suggest. In fact, […],[508] while Cristal's purchases from […], are also relatively modest within the context of their overall sales.

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505 Given the Parties' combined market share (above [30-40]%) on the downstream market for chloride-based titanium dioxide pigment for use in paper laminate, each of the narrower upstream markets for individual types of chloride titanium feedstocks is vertically affected. The analysis of potential customer foreclosure presented in this section would remain the same, however, as the production of chloride-based titanium dioxide pigment for use in paper laminate represents a similarly minimal proportion of total consumption of any particular type of chloride titanium feedstock. In relation to potential input foreclosure, meanwhile, the following sections that address the links between the merged entity's position in the individual upstream markets where they have a market share of above [30-40]% (leucoxene and chloride ilmenite) and possible downstream markets for titanium dioxide pigment apply equally to the downstream market for chloride-based titanium dioxide pigment for use in paper laminate.

506 See Response to RFI4, Annex 5.

507 In fact, based on ID 2124-2425 and Annex 6.2-4 of the Form CO, Cristal's purchases of chloride titanium feedstock for its plant in [the EEA] can be estimated at around […] TiO2 units in 2016. As only […]% of this plant's output accounts for chloride-based titanium dioxide pigment for use in paper laminate, it can be estimated that Cristal's demand ([…]) on the global market for chloride titanium feedstock represents approximately only [0-20]%.

508 […].

(532) Furthermore, as Cristal […] manufactures its chloride-based titanium dioxide pigment grade for use in paper laminate in [the EEA], and as this particular grade only accounts for […]% of the plant's output (based on 2017 data), Cristal's external purchases of chloride titanium feedstocks related to the production of […] (i.e. those purchases in relation to which a vertically affected market arises) necessarily only represent a small proportion of its overall use of chloride titanium feedstocks, considering all grades produced at all of its plants.

(533) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition as a result of the vertical link between the upstream market for chloride titanium feedstocks and the downstream market for chloride-based titanium dioxide pigment for use in paper laminate.

7.3.2.2. Vertical link between leucoxene and titanium dioxide pigment

(534) The Transaction creates a vertically affected link between the upstream market for leucoxene, where the merged entity's combined market share is [50-60]% in 2016, and the possible downstream markets for titanium dioxide pigment. As titanium dioxide pigment producers source titanium feedstocks on the basis of their suitability for a particular plant (rather than for the production of a particular type of titanium dioxide pigment[509]) and as any one plant typically produces a number of different grades of titanium dioxide pigment, it is practically impossible for the merged entity to adopt a strategy of input foreclosure in relation to any specific narrower market for titanium dioxide pigment for use in a particular application. Were input foreclosure to occur, this would therefore affect production of all types of titanium dioxide pigment (or at least all those produced at any particular competitor's plant targeted by the input foreclosure) to an equal extent.

(535) Cristal currently […]. The Commission therefore considers that the Transaction does not change the market position and ability of the merged entity on the market for the supply of leucoxene to titanium dioxide pigment producers.

(536) The Commission also considers that, despite its relatively high market share in the upstream market for leucoxene ([50-60]% in 2016), the merged entity would, post-Transaction, in any event have neither the ability nor the incentive to restrict […] access to leucoxene in a manner that could result in a significant impediment to effective competition on the downstream market for titanium dioxide pigment, as leucoxene is not of itself an essential input for any of […] titanium dioxide pigment plants.

(537) The Notifying Party provided detailed information (based on TZMI data) for the period 2012-2016 demonstrating […] ability to vary its mix of titanium feedstocks.[510] The variation in titanium feedstocks used and the relatively modest proportion of total titanium feedstocks used that leucoxene represented is evidence that […] can easily use other titanium feedstocks in place of leucoxene. […].

(538) The Commission further considers that the length of the agreement between Cristal and […] means that […] would have sufficient time to find alternative suppliers of leucoxene, were the merged entity to try to restrict its access to this particular input after 2020. This would also reduce any incentive the merged entity might otherwise have had to restrict access to leucoxene.

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509 In particular, it should be noted that titanium feedstocks used are not adapted each time a grade change is performed on a production line.

510 Form CO, Annex 6.2-2.

(539) More generally, it should also be noted that leucoxene is not the highest quality chloride feedstock. Natural rutile and all upgraded chloride feedstocks (chloride slag, slag fines, upgraded slag and synthetic rutile) would typically have a higher titanium dioxide content than leucoxene.[511] This means that titanium dioxide pigment producers would be likely to be able to replace leucoxene by any one of these higher quality titanium feedstocks. Moreover, leucoxene accounted for less than [0-10]% of the production of all chloride feedstocks in 2016, suggesting that the, much larger, neighbouring markets would be easily able to supply customers with the necessary input for their titanium dioxide pigment production.

(540) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition on any of the plausible markets for titanium dioxide pigment, in relation to the vertical link to the upstream market for leucoxene.

7.3.2.3. Vertical link between chloride ilmenite and titanium dioxide pigment

(541) The Transaction creates a vertically affected link between the upstream market for chloride ilmenite, where the merged entity's combined market share would be [30-40]% in 2016, and the possible downstream markets for titanium dioxide pigment. As titanium dioxide pigment producers source titanium feedstocks on the basis of their suitability for a particular plant (rather than for the production of a particular type of titanium dioxide pigment) and as any one plant typically produces a number of different grades of titanium dioxide pigment, it is practically impossible for the merged entity to adopt a strategy of input foreclosure in relation to any specific narrower market for titanium dioxide pigment for use in a particular application. Were input foreclosure to occur, this would therefore affect production of all types of titanium dioxide pigment (or at least all those produced by any particular manufacturer targeted by the input foreclosure) to an equal extent.

(542) The Notifying Party submits that Tronox's sales of chloride ilmenite […]. For Cristal's sales, the Notifying Party argues that […] could easily use other high-grade titanium feedstocks instead of chloride ilmenite, i.e. if the Notifying Party were to restrict […] access to that particular titanium feedstock.

(543) The Commission notes, first, that there would remain a significant number of other strong suppliers of chloride ilmenite active on the sales market post-Transaction, including Kenmare with a market share of [10-20]%, Rio Tinto with [10-20]%, TiZir with [10-20]% and Group DF with [10-20]%.

(544) Second, as mentioned above, the evidence presented by the Notifying Party[512] indicates that […] used widely varying volumes of at least […] different titanium feedstocks over the period 2012-2016 at each of its plants. The only plant that used a consistently higher proportion of chloride ilmenite and showed less variation from year to year […]. […] plants in […] used varying proportions of chloride ilmenite[513]but also six other titanium feedstocks were nonetheless used (including a small amount of some sulphate titanium feedstocks), illustrating that this is technically possible for […] and that […] does not necessarily rely on chloride ilmenite.

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511 The titanium content of rutile can vary between [50-70]% and [80-100]%, but leucoxene used in titanium dioxide pigment production is more often towards the lower end of this scale. Upgraded chloride feedstocks typically have titanium content of between [80-100]% and [80-100]%.

512 Annex 6.2-2 of the Form CO.

513 […].

(545) More generally, it should also be noted that chloride ilmenite has the lowest titanium content of the chloride titanium feedstocks and replacing this with any higher grade titanium feedstock (such as leucoxene, natural rutile or any upgraded chloride titanium feedstock) is therefore technically possible. Chloride ilmenite accounted for around a quarter of total chloride titanium feedstocks sales. Suppliers of other titanium feedstocks, as well as other suppliers of chloride ilmenite would therefore be able to continue serving customers active in titanium dioxide pigment production in a competitive manner.

(546) The Commission therefore concludes that the Transaction is unlikely to significantly impede effective competition on any of the possible markets for titanium dioxide pigment, in relation to the vertical link to the upstream market for chloride ilmenite.

8. ZIRCON

8.1. Introduction

(547) Zircon is an opaque, inert zirconium mineral frequently found in mineral sands deposits containing ilmenite and rutile and is therefore generally mined as a co-product of these titanium feedstocks. Mineral sands are not usually mined for the main purpose of extracting zircon.[514] A large proportion of zircon is used in the ceramics industry, in particular for the production of tiles and sanitary fittings. Zircon is also used in a number of other industries including foundries (for moulding), refractories (e.g. for bricks), the chemical industry (in zirconium chemicals), the zirconium metal industry and in insulating fibre and glass.

8.2. Market definition

8.2.1. Product market definition

8.2.1.1. The Commission's past decisional practice

(548) In *Anglo American/Kumba Resources*, the Commission noted that there were different grades of zircon available, which vary in terms of the levels and types of impurities present and the particle size. The question as to whether different grades of zircon could be considered to constitute distinct product markets was, however, left open.[515]

8.2.1.2. The Notifying Party's view

(549) The Notifying Party submits that the relevant product market definition for zircon may be left open as there is no widely accepted categorisation for different grades of zircon.[516]

(550) The Notifying Party explained that a general distinction can be made between premium grade and standard grade zircon, on the basis of the levels of impurities. The Notifying Party also points out that standard grade zircon is not typically sold in

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514 With the notable exception of one mine, Jacinth Ambrosia, owned by Iluka, and which accounts for around [20-30]% of global zircon production.

515 Commission Decision Case M.3276 – *Anglo American / Kumba Resources*, 3 December 2003, paragraphs 9-10.

516 The Notifying Party explains that suppliers of zircon typically describe their products according to their geological origin. For example, Tronox commercialises "Namakwa zircon" from its Namakwa Sands mine in South Africa, "KZN Sands zircon" from its KZN Sands mine in South Africa and "Northern Operations zircon" from its Northern Operations mine in Western Australia, while Cristal offers "Murray Basin zircon" from its mine in Eastern Australia.

the EEA, due to EU regulations restricting the sale of products with above a certain level of uranium or thorium content.

(551) The Notifying Party submits, however, that it would not be appropriate to segment the market for zircon either according to quality (i.e. premium and standard grade) or on the basis of end use as the large majority of the Parties' sales of zircon are made to millers, which blend zircon from a number of suppliers and re-sell it to a range of end users, meaning that the Parties have little visibility into sales to specific groups of end customers.

8.2.1.3. The Commission's assessment

(552) The Commission's investigation has confirmed that market participants generally recognise the existence of a distinction between premium and standard grade zircon.[517]

(553) There was general consensus amongst market participants that premium grade zircon would have low levels of titanium dioxide and iron oxide impurities in particular. Levels of uranium, thorium and aluminium oxide were also mentioned.[518]

(554) For the purpose of this case, the question as to whether different grades of zircon could be considered to constitute distinct product markets can, in any case, be left open, as the Transaction does not create competition concerns on these markets under any plausible product market definition including the narrowest plausible product market for premium grade zircon.

8.2.2. Geographic market definition

8.2.2.1. The Commission's past decisional practice

(555) The geographic market definition for zircon was left open in the Commission's most recent case relating to zircon, *Anglo American/Kumba Resources* (with markets shares being considered at both EEA and global level).[519]

8.2.2.2. The Notifying Party's view

(556) The Notifying Party makes reference to an earlier case, *RTZ/CRA*,[520] in which the market for zircon was considered to be global, and argues that the same geographic definition should be applied in this case.

(557) The main reasons for this are, first, that zircon is sourced from mines in a limited number of locations (Australia, South Africa and China being the three largest producers), while customers are present worldwide, thus making it inevitable that zircon is traded globally. Second, the Notifying Party argues that transport costs do not create any barrier to global trade, with transport to the EEA (from Australia or South Africa) typically representing no more than [0-10]% of the total cost. Lastly, the Notifying Party submits that zircon prices are very similar in all regions and typically move together.

8.2.2.3. The Commission's assessment

(558) The Commission considers there to be some evidence in favour of an EEA-wide market for zircon, but also recognises indications of a global market.

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517 Questionnaire 4 to competitors in zircon and feedstocks, Q9. Questionnaire 3 to zircon customers, Q6.

518 Questionnaire 4 to competitors in zircon and feedstocks, Q10. Questionnaire 3 to zircon customers, Q7.

519 Commission Decision Case M.3276 – *Anglo American / Kumba Resources*, 3 December 2003, paragraph 17.

520 Commission Decision Case M.660 – *RTZ / CRA*, 7 December 1995, paragraph 13.

(559) The main feature of the market that would suggest it may be less than global in scope is the difference in customer preferences and in the products traded in different regions. As mentioned above, lower quality zircon cannot usually be imported into the EU (due to its uranium and thorium content) but is used elsewhere, in particular in China. In addition, differences in consumer tastes mean that there is still a more pronounced tendency to use high quality premium grade zircon in ceramics to be sold in the EU than there is elsewhere (in particular Asia), as European customers are accustomed to a "perfectly white" colour, in particular for bathroom tiles, for example, whilst lower grade zircon tends to produce ceramics that look slightly yellowish.[521] Furthermore, the Notifying Party itself acknowledges that EEA customers in other areas (namely […]) tend to have higher quality requirements than customers in the same sectors in other regions.

(560) Notwithstanding the above, most competitors confirm that they supply customers worldwide and that market conditions tend to be consistent between regions.[522] In addition, they do not report there being any barriers to importing zircon into the EEA.[523] A minority of respondents did, however, state that the market dynamics can be different in particular regions, for example in China.[524]

(561) With regard to prices, the majority of competitors and customers state that prices are broadly the same worldwide.[525] Some competitors do, however, agree prices on a regional basis when customers are active in more than one area.[526] A small proportion of customers also reported having observed differences in prices between different regions.[527] Some also stated that they have separate contracts (or at least different prices) for the different regions in which they are active.[528]

(562) Competitors' views on the importance of transport costs, as a proportion of the total price, varied somewhat, with some competitors considering transport costs to be fairly insignificant while others state that they do represent a meaningful proportion of the overall price. Responses from competitors suggest that the proportion of the purchase price of zircon sold in the EEA accounted for by transport costs varies from as little as 5% up to as much as 20%. In other regions, transport costs can represent up to 25% of the total price for some suppliers.[529] In view of these costs, some competitors noted that it is more profitable for them to sell in certain regions than others.[530]

(563) Differences in transport and logistics costs may also mean that zircon suppliers based in South Africa have an advantage over those based in Australia (or in other locations) in relation to sales in the EEA.[531] Some customers also confirmed that the

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521 Minutes of call with a zircon competitor, 18 August 2017, 16.00, ID 1644.

522 Questionnaire 4 to competitors in zircon and feedstocks, Q29, Q31.

523 Questionnaire 4 to competitors in zircon and feedstocks, Q32.

524 Minutes of call with minerals trader, 21 August 2017, 11.00, ID 2063.

525 Questionnaire 4 to competitors in zircon and feedstocks, Q33. Questionnaire 3 to zircon customers, Q31.

526 Questionnaire 4 to competitors in zircon and feedstocks, Q34.

527 Questionnaire 3 to zircon customers, Q25.

528 Questionnaire 3 to zircon customers, Q30.

529 Questionnaire 4 to competitors in zircon and feedstocks, Q36.

530 Questionnaire 4 to competitors in zircon and feedstocks, Q36.

531 Minutes of call with zircon customer, 11 August 2017, 11.00, ID 2598. Questionnaire 3 to zircon customers, Q25.

location of the supplier is a factor that they take into account when purchasing zircon, not only due to transport costs but also the transit time.[532]

(564) For the purposes of this case, the exact geographic market definition for zircon can, in any case, be left open between either a global or an EEA-wide market, as the Transaction does not create competition concerns under either plausible geographic market definition.

8.3. Competitive assessment

(565) Both Tronox and Cristal produce zircon as a co-product of their titanium feedstocks.[533] They sell zircon primarily to the ceramic industry (often via millers), to refractories and to foundries.

8.3.1. Market structure

(566) Table 11 shows the Parties' and their competitors' market shares on the EEA and global markets for zircon over the period 2014-2016.

Table 11: Global and EEA market shares for zircon, 2014-2016 (based on volumes)

	Global			EEA		
	2014	2015	2016	2014	2015	2016
TOTAL market size (in kt)	[…]	[…]	[…]	[…]	[…]	[…]
Tronox	[10-20]%	[10-20]%	[10-20]%	[30-40]%	[20-30]%	[20-30]%
Cristal	[5-10]%	[5-10]%	[5-10]%	[10-20]%	[5-10]%	[5-10]%
Combined	**[20-30]%**	**[20-30]%**	**[20-30]%**	**[40-50]%**	**[30-40]%**	**[30-40]%**
Iluka	[20-30]%	[20-30]%	[20-30]%	[20-30]%	[20-30]%	[30-40]%
Rio Tinto	[10-20]%	[20-30]%	[10-20]%	[10-20]%	[20-30]%	[20-30]%
TiZir	[0-5]%	[0-5]%	[5-10]%	[0-5]%	[5-10]%	[5-10]%
Sibelco	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Kenmare	[0-5]%	[0-5]%	[0-5]%	[10-20]%	[5-10]%	[5-10]%
Vilnohirsk	[0-5]%	[0-5]%	[0-5]%	[5-10]%	[0-5]%	[0-5]%
Chinese competitors	NA	[10-20]%	[10-20]%	[0-5]%	[0-5]%	[0-5]%
Other	[10-20]%	[0-5]%	[5-10]%	[0-5]%	[0-5]%	[0-5]%

Source: Form CO and Annex 6.2-12 of Form CO

(567) As can be seen from Table 11, on the overall global market for zircon, the merged entity would have a market share […] to that of the current market leader, Iluka. Prior to the merger, Tronox and Rio Tinto had […] market shares behind Iluka. The three main suppliers before the merger would therefore remain the top three players, with only a small change in their relative positions.[534] There would remain a large group of other smaller suppliers active on the market, including TiZir, Sibelco and Kenmare, with respective market shares of up to [5-10]%, and several Chinese competitors, together accounting for [10-20]% of the global market.

(568) On a possible market for premium grade zircon, the merged entity would have a market share of around [30-40]% at both global and EEA level. At global level, the merged entity would become the largest supplier (ahead of Iluka, [20-30]%), whilst at EEA level it would have a slightly smaller market share than Iluka ([30-40]%). On both markets, Rio Tinto would also remain a strong competitor with market shares of [10-20]% at global level and [20-30]% at EEA level. On both markets, the merged entity would also continue to face competitive pressure from a range of smaller

532 Questionnaire 3 to zircon customers, Q27.

533 Tronox produces zircon from feedstocks from […]. Cristal produces zircon from […].

534 At EEA level there is effectively no distinction between an overall market for zircon and a market for premium-grade zircon, as standard grade cannot be imported into the EEA.

suppliers, including Kenmare (almost [5-10]% market share on the EEA market for premium zircon) and TiZir (just over [5-10]% at EEA level and close to [5-10]% at global level).

(569) As can be seen from Table 11, both Tronox and Cristal's sales of zircon in the EEA fell over the period 2014-2016 (Tronox's sales from […]kt in 2014 to […]kt in 2016 and Cristal's sales from […]kt to […]kt over the same period). This is reflected in the merged entity's combined market shares which decreased from [40-50]% in 2014 to [30-40]% in 2016.

8.3.2. Iluka is and will remain the clear market leader

(570) Both competitors and customers contacted by the Commission as part of its market investigation emphasised the strength of Iluka's position on the zircon market.

(571) First, all customers (that provided an answer to this question) identified Iluka as the top supplier of premium grade zircon and all but one named it as the top supplier of zircon overall (with one customer naming Rio Tinto).[535]

(572) The responses to the market investigation also highlighted the importance of the fact that Iluka is the only zircon supplier for which zircon is not a by-product, and which therefore determines its mining rates with respect to the zircon market. Several market participants also suggested that Iluka restricts supply so as to keep prices at a certain level, and one smaller competitor also indicated that it tends to follow the prices set by Iluka.[536] [537]

8.3.3. Cristal is not seen as a major competitor on the market for zircon

(573) The results of the market investigation also confirmed that Cristal is not generally regarded as a major actor on the zircon market. When asked to name the largest suppliers, only a small number of customers cited Cristal amongst the top five, and even then never in the top three.[538]

(574) In addition, market participants mentioned that Cristal is more focused on the Asian market and does not compete strongly in the EEA.[539] [540]

8.3.4. The Parties are not close competitors

(575) The results of the market investigation indicated that Tronox and Cristal are not close competitors. All customers that responded to the question asking them to name Tronox's closest competitor cited Iluka, and most placed Rio Tinto second.[541] In addition, almost all customers that responded also named Iluka as Cristal's closest competitor.[542]

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535 Questionnaire 3 to zircon customers, Q39.
536 Minutes of call with zircon supplier, 17 August 2017, 10.00, ID 1544.
537 Minutes of call with zircon customer, 11 August 2017, 11.00, ID 2598.
538 Questionnaire 3 to zircon customers, Q39.
539 Questionnaire 3 to zircon customers, Q62.1.
540 Questionnaire 4 to competitors in zircon and feedstocks, Q81.3.
541 Questionnaire 3 to zircon customers, Q47.
542 Questionnaire 3 to zircon customers, Q48.

8.3.5. Competitive constraint from neighbouring markets

(576) The majority of market participants reported that zircon could be replaced to a certain extent in at least some end-applications.[543]

(577) In general, it is easier to replace zircon with other inputs in lower quality products,[544] particularly lower quality ceramics.[545] The products that can be used in place of zircon vary according to the particular application but can include fused alumina, feldspar, white clays such as kaolinite, chromite sand, mullite, silica sand and zinc oxide.[546] Whilst there might be a wide range of alternatives, customers and competitors did also stress that at least some of these will result in a final product of inferior quality[547] or necessitate other changes to the production process.[548]

(578) Nonetheless, a significant number of competitors report that there was significant switching away from zircon during the period 2010/11-2012/13, when prices rose significantly.[549] Competitors estimate that the market shrunk by somewhere between 20% and 30% as a result of customers finding alternatives and reducing their zircon consumption.

8.3.6. Low barriers to entry

(579) The market for zircon is characterised by low barriers to entry, as evidenced by the recent entry of several new players. The new entrants most often mentioned by customers and competitors include TiZir, Southern Ionics, MZI and Base Resources.[550]

(580) Furthermore, it can be noted that all of these players have been able to establish a meaningful presence on the market for zircon within a relatively short space of time (less than five years), with TiZir for example achieving a market share of close to [5-10]% at global level and [5-10]% at EEA level in 2016.

8.3.7. Neither customers nor competitors expect the Transaction to have a significant effect on the markets for zircon

(581) As explained above, the dynamics of the zircon market are strongly influenced by the fact that zircon is a by-product of titanium feedstocks. With the significant exception of Iluka, none of the main zircon suppliers are mining with the main aim of producing zircon. This means that the volumes offered by all other suppliers are to a large extent dictated by the titanium feedstocks market.[551]

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543 Minutes of call with zircon customer, 28 June 2017, 12.00, ID 2638. Questionnaire 4 to competitors in zircon and feedstocks, Q17.

544 Minutes of call with zircon customer, 28 June 2017, 16.00, ID 2601. Questionnaire 3 to zircon customers, Q17.

545 Questionnaire 4 to competitors in zircon and feedstocks, Q17.

546 Minutes of call with zircon customer, 28 June 2017, 12.00, ID 2638. Questionnaire 4 to competitors in zircon and feedstocks, Q19. Questionnaire 3 to zircon customers, Q18.2.

547 Minutes of call with zircon customer, 28 June 2017, 16.00, ID 2601. Questionnaire 3 to zircon customers, Q18.2.

548 Minutes of call with zircon customer, 28 June 2017, 12.00, ID 2638.

549 Questionnaire 4 to competitors in zircon and feedstocks, Q17, Q18.

550 Questionnaire 3 to zircon customers, Q45. Questionnaire 4 to competitors in zircon and feedstocks, Q54.

551 Minutes of call with zircon customer, 28 June 2017, 12.00, ID 2638.

(582) The majority of competitors and customers stated that the Transaction would have minimal or no effect on supply capacity.[552]

(583) The majority of customers that responded to the market investigation were of the opinion that the Transaction would have no or only a minimal effect on the market for zircon, and a small number even expected there to be a positive effect.[553]

8.3.8. Conclusion of horizontal effects on the markets for zircon

(584) Based on the results of the market investigation, the Commission concludes that the Transaction would not lead to a significant impediment to effective competition on the market for zircon, irrespective of the exact product or geographic market definition applied.

9. CONCLUSION ON THE TRANSACTION

(585) In conclusion, for the reasons set out in Sections 6, 7 and 8, the Commission finds that:

(1) the notified concentration would significantly impede effective competition in the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, within the meaning of Article 2(3) of the Merger Regulation and Article 57 of the Agreement on the European Economic Area ("EEA Agreement"), as a result of non-coordinated effects;

(2) the notified concentration would not significantly impede effective competition in the EEA markets for titanium dioxide pigment for use in mass applications (or their possible sub-segmentations) as a result of either non-coordinated or coordinated effects;

(3) the notified concentration would not significantly impede effective competition in the titanium feedstocks markets as a result of non-coordinated effects;

(4) the notified concentration would not significantly impede effective competition in the market for zircon as a result of non-coordinated effects.

10. REMEDIES

10.1. Commitments offered by the Parties

(586) In order to render the notified concentration compatible with the internal market and the EEA Agreement in relation to the EEA market for chloride-based titanium dioxide pigment for use in paper laminate, the Notifying Party has modified the notified concentration pursuant to Article 8(2) of the Merger Regulation by submitting commitments. The Notifying Party submitted a first set of commitments on 16 May 2018 ("the First Commitments"). In order, in particular, to address the results of the market test of the First Commitments, the Notifying Party submitted an amended set of commitments on 1 June 2018 ("the Final Commitments").

(587) With a view to addressing the concerns identified by the Commission in relation to the market for chloride-based titanium dioxide pigment for use in paper laminate, the Notifying Party has committed to divest Tronox's 8120 grade, thus removing the full overlap between the Parties' activities in this market. In particular, the Final

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552 Questionnaire 4 to competitors in zircon and feedstocks, Q81.2. Questionnaire 3 to zircon customers, Q62.3.

553 Questionnaire 3 to zircon customers, Q62.1.

Commitments involve divestment of the technical knowledge for and rights to the production of this grade and all associated customer contracts. The Final Commitments include an up-front buyer provision, meaning that Tronox would not be able to complete the acquisition of Cristal until it had signed a binding agreement with a purchaser approved by the Commission. The assets and operations to be divested under the Final Commitments are referred to collectively in this Decision as "the Divestment Business".

10.1.1. Description of the Final Commitments

(588) The Divestment Business comprises: (i) all "know-how" used for the production of the 8120 grade,[554] (ii) all customer contracts and other records relating to the 8120 grade, (iii) all licences, permits and authorisations used in relation to the 8120 grade business, (iv) if required by the purchaser, employees with technical and/or customer knowledge of the 8120 grade business,[555] (v) all goodwill related to the 8120 grade business including the exclusive right to market this grade, (vi) a transitional supply agreement of a duration of […], extendable […], for the production of 8120 grade at Tronox's Botlek plant,[556] and (vii) a technical services agreement of a duration of […], extendable […], under which Tronox will provide the purchaser with the necessary support for the transfer of production to its facility. A complete description of the Divestment Business is set out in the Final Commitments.

(589) The Notifying Party submits that there are no tangible assets used exclusively for the production of 8120 grade that a purchaser is unlikely to possess already, or that would not be easily obtainable. Tronox commits, however, to assist the purchaser in acquiring any assets currently used by the Divestment Business and necessary for its continued viability and competitiveness.

(590) Table 12 shows the global and EEA turnover of the Divestment Business over the last three years.

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554 […]. The Notifying Party commits to transfer know-how used exclusively for the production of the 8120 grade and to grant the purchaser a royalty-free, irrevocable, non-exclusive, global licence to use know-how that is used to produce both the 8120 and other grades.

555 Tronox submits that […]. If required by the Purchaser, Tronox will, however, transfer one employee with 8120 sales and customer knowledge and/or one employee with technical knowledge of the 8120 grade.

556 Tronox will supply the 8120 grade at a price and in quantities determined by formulae set out in the Final Commitments.

Table 12: Global and EEA turnover of the Divestment Business 2015-2017

in EUR million	**2015**	**2016**	**2017**
Global turnover	[…]	[…]	[…]
EEA turnover	[…]	[…]	[…]

Source: Form RM

(591) The Final Commitments also cover the separation of the Divestment Business from Tronox's other operations, preservation of the viability and competitiveness of the Divestment Business, and the appointment of and cooperation with a monitoring trustee.

(592) The Notifying Party submits that the Final Commitments would fully address the Commission's competition concerns by entirely removing Tronox's activity in the market for chloride-based titanium dioxide for use in paper laminate and by introducing a new competitor on that market. The Notifying Party further maintains that the Divestment Business includes all the knowledge and support necessary to allow the purchaser to compete effectively on the market, and that the transitional supply agreement would ensure continuity for customers.

(593) The Final Commitments stipulate that the Transaction cannot be implemented until Tronox has entered into a final binding sale and purchase agreement for the sale of the Divestment Business and the Commission has approved the purchaser and the key terms of sale. The Notifying Party has identified Venator Materials PLC ("Venator") as a suitable purchaser of the Divestment Business. Venator is headquartered in the United Kingdom and is the largest supplier of titanium dioxide pigment in the EEA.

10.1.2. The Commission's assessment of the Final Commitments

(594) The Commission analysed the suitability of the Final Commitments to address the significant impediment to effective competition in this case against the standard set out in the Commission Notice on Remedies.[557]

10.1.2.1. Framework for the Commission's assessment of the Final Commitments

(595) Where a notified concentration leads to a significant impediment to effective competition, the parties may modify the notified concentration so as to remove the significant impediment to effective competition identified by the Commission, with a view to having the concentration declared compatible with the internal market pursuant to Article 8(2) of the Merger Regulation.

(596) In assessing whether or not commitments are likely to remove its competition concerns, the Commission considers all relevant factors including, *inter alia*, the type, scale and scope of the commitments with reference to the structure and the particular characteristics of the market in which the Commission has identified a significant impediment to effective competition.[558] Moreover, commitments must be capable of being implemented effectively within a short period of time.[559]

(597) Divestiture commitments are the best way to remove a significant impediment to effective competition resulting from horizontal overlaps in the merging parties'

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557 Commission Notice on remedies acceptable under Council Regulation (EC) No 139/2004 and under Commission Regulation (EC) No 802/2004 (2008/C 267/01), (the "Commission Notice on Remedies").

558 Commission Notice on Remedies, paragraph 9.

559 Commission Notice on Remedies, paragraph 9.

activities.[560] Other commitments (such as licensing) may be suitable to remove a significant impediment to effective competition if they are equivalent to divestitures in their effects. The divested activities must consist of a viable business that, if operated by a suitable purchaser, can compete effectively with the merged entity on a lasting basis and that is divested as a going concern.[561]

(598) The business to be divested must include all the assets which contribute to its current operation or which are necessary to ensure its viability and competitiveness, and all personnel which are currently employed or which are currently shared between the business to be divested and other businesses of the parties, but which contribute to the operation of the business or which are necessary to ensure its viability and competitiveness. Otherwise, the viability and competitiveness of the business to be divested would be endangered. The business to be divested must therefore include the members of staff that perform essential roles for the business, at least in a sufficient proportion to meet the ongoing needs of the business to be divested.[562]

(599) Furthermore, the intended effect of the divestiture will only be achieved if and once the business is transferred to a suitable purchaser with the ability to maintain and develop the business to be divested as a viable and active competitive undertaking.

10.1.2.2. Results of the market test

(600) The Commission launched a market test on 17 May 2018 to assess the suitability and viability of the First Commitments.

(601) The results of the market test indicated that the First Commitments are sufficient to address the competition concerns identified on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate. Both customers and competitors were reasonably confident that the remedy would be viable and that a suitable purchaser could compete effectively on the market.

(602) First, all competitors that expressed a view stated that the assets included in the Divestment Business are complete and include all items necessary to successfully transfer production of the 8120 grade and to replicate Tronox's position on the market.[563] The majority of competitors also confirmed that there were no other assets of any type that would need to be included in the business.[564]

(603) A small number of competitors and customers acknowledged that there might be slight differences in the characteristics of the end product, due to it being produced at a different plant, as grades produced at different sites with different technology can never be identical.[565] This would not, however, detract from the feasibility of the remedy as customers would, in any case, need to requalify the grade,[566] and all of the customers that provided an answer to the question stated that they would try to requalify the grade.[567] As such, it can be concluded that the need to requalify would not prevent the remedy from being successful.

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560 Commission Notice on Remedies, paragraph 17.
561 Commission Notice on Remedies, paragraph 23.
562 Commission Notice on Remedies, paragraphs 25 and 26.
563 Questionnaire 11 to competitors, Q2.
564 Questionnaire 11 to competitors, Q4.
565 Questionnaire 10 to customers, Q4.1, Q16. Questionnaire 11 to competitors, Q5.1, Q5.2.
566 Questionnaire 10 to customers, Q13.1. Questionnaire 11 to competitors, Q19.
567 Questionnaire 10 to customers, Q13.1.2.

(604) The results of the market test also generally confirmed the adequacy of the arrangements envisaged for the transitional period. The majority of competitors and customers (of those that expressed a view) stated that the terms of the transitional supply agreement would allow the purchaser to sell the 8120 grade competitively and without disruption during this time.[568]

(605) Responses provided by customers did, however, indicate that the duration of the technical services agreement and the transitional supply agreement provided for in the First Commitments was potentially insufficient. Half of customers were of the opinion that these agreements should have a duration of over […].[569] The terms of the Final Commitments were therefore amended to take into account the need for a longer transitional period.[570] The new duration of the agreements is also aligned with the total expected time needed for the production transfer (up to […][571]) followed by the requalification of the grade by customers (up to […] or potentially even longer for some[572]).

(606) The main criteria for a suitable purchaser identified by customers and competitors were that it should be active in the EEA,[573] have its own (preferably direct) sales network in the EEA,[574] and either have chloride-based production facilities in the EEA where it could produce the 8120 grade or have warehousing and strong logistics in the EEA allowing it to produce elsewhere but still sell in the EEA at competitive prices.[575]

(607) The Commission also obtained the views of customers and competitors as to the suitability of Venator as a potential purchaser during the market test. Most market participants that expressed a view believed that Venator would be able to compete effectively and on a lasting basis on the market in question. In addition, both customers and competitors emphasised Venator's experience as a chloride-based producer and its knowledge of the paper laminate market (resulting from its sales of sulphate-based grade) as factors likely to make it successful in taking over the Divestment Business.[576] One competitor explained, for example: "Venator has many years' experience in the chloride pigment production. Its portfolio already contains grades which are used in the manufacture of all kinds of paper, including laminate paper (sulphate grade R610L). Thus, it is experienced in the production process (know-how for finishing stage of laminate paper grade treatment) as well as in the field of application and customer support."[577]

(608) Half of the customers reported that, if Venator were to acquire the Divestment Business, they would be likely to start purchasing the 8120 grade from Venator, and

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568 Questionnaire 10 to customers, Q8. Questionnaire 11 to competitors, Q11.

569 Questionnaire 10 to customers, Q11.

570 More specifically, the First Commitments specified a duration of […], with […]. In view of the results of the market test, the Notifying Party increased this to […].

571 Questionnaire 11 to competitors, Q9.

572 Questionnaire 10 to customers, Q13.1.1.

573 Questionnaire 10 to customers, Q14.1. Questionnaire 11 to competitors, Q20.1.

574 Questionnaire 10 to customers, Q14.2. Questionnaire 11 to competitors, Q20.2.

575 Questionnaire 10 to customers, Q14., Q14.4.1, Q14.5, Q14.5.1. Questionnaire 11 to competitors, Q20.4, Q20.4.1, Q20.5, Q20.5.1.

576 Questionnaire 10 to customers, Q15.2, Questionnaire 11 to competitors, Q22.1, Q23.1.

577 Questionnaire 11 to competitors, Q23.1.

most of the remaining customers would potentially do so, depending on factors such as Venator' sales strategy and pricing.[578]

(609) For the avoidance of any doubt, it should be noted that this Decision in no way constitutes approval of Venator as a suitable purchaser of the Divestment Business. The Commission will assess this subsequently in a separate decision.

(610) Lastly, a large majority of competitors confirmed that the role of the monitoring trustee is sufficient.[579]

10.1.2.3. Suitability of the Final Commitments to remove competition concerns

(611) The Commission considers that the Final Commitments proposed by the Notifying Party are suitable to address the significant impediment to effective competition that the Transaction would otherwise lead to on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate. The Final Commitments would remove the entire overlap between the Parties' activities on this market and would ensure that the market continues to be populated by a minimum of four active suppliers.

(612) The Commission considers that the Divestment Business can be a viable and competitive business, despite the fact that it is not currently operated on a stand-alone basis. The volumes of the 8120 grade currently produced by Tronox, and the size of the overall paper laminate market, suggest that the grade could be produced at one of the existing plants owned by the purchaser, providing capacity is or can be made available.

(613) Although the 8120 grade is produced in lower volumes than some of Tronox's main plastics and coatings grades, it nonetheless achieved global sales of EUR […] in 2017, of which EUR […] were in the EEA, and it is a profitable business.

(614) In view, in particular, of the results of the market test, the duration of the transitional supply agreement and the technical services agreement has been extended in the Final Commitments as compared with the First Commitments proposed by the Notifying Party. The Commission considers that the transitional period of […], extendable up to a total maximum duration of […], as provided for in the Final Commitments is sufficient to ensure that the purchaser can acquire the necessary expertise to be able to take on production of the 8120 grade successfully and to allow customers sufficient time to requalify the product.

(615) Following submission of the First Commitments, changes were also made to the provisions relating to the quantities and the cost of the 8120 grade produced by Tronox on behalf of the purchaser during the transitional period. On the basis of these changes, the Commission considers that the transitional supply agreement now allows the purchaser to compete effectively on the market, in particular as it would have sufficient scope to increase sales potentially up to […] kt/y and would not be disadvantaged in terms of its cost structure relative to the costs faced by Tronox prior to the Transaction.

(616) In view of recitals (618) to (622), the Commission considers that the Final Commitments are adequate to ensure the viability and competitiveness of the Divestment Business.

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578 Questionnaire 10 to customers, Q18.

579 Questionnaire 11 to competitors, Q29.

(617) Tronox must enter into a final binding sale and purchase agreement for the sale of the Divestment Business with a purchaser approved by the Commission before the Transaction can be closed.

(618) The Commission considers that the criteria set out in the Final Commitments are adequate to ensure the suitability of the purchaser. In particular, the Final Commitments stipulate that the purchaser must have proven expertise and a quality track record in chloride-based titanium dioxide pigment production, must have sufficient capacity (at the latest by 18 months after the closing of the Transaction) to replicate Tronox's competitive position, and must submit a business plan for the Divestment Business to the Commission, which would allow the Commission to assess whether the purchaser is able to demonstrate sufficient incentive and intention to maintain the Divestment Business as a competitive force.

(619) The Commission also notes that the purchaser proposed by the Notifying Party, Venator, would appear to meet the criteria set out above. The Commission will formally assess the suitability of Venator as a purchaser in a separate decision. Nonetheless the identity of the proposed purchaser, Venator, removes concerns about the viability of the remedy that the Commission may otherwise have had at this stage. In particular, Venator's experience in chloride-based manufacturing makes the transfer of production of the 8120 grade to a new facility feasible, whilst its existing presence and installed chloride production capacity in the EEA and knowledge of the paper laminate market would allow the business to be preserved from a commercial perspective.

(620) In light of the above, the Commission considers the Final Commitments to be sufficient in scope and suitable to remove the serious impediment to effective competition that would otherwise result from the Transaction on the EEA market for chloride-based titanium dioxide pigment for use in paper laminate.

10.2. Conclusion on proposed remedies

(621) For the reasons outlined above, the Final Commitments submitted by the Notifying Party in relation to the EEA market for chloride-based titanium dioxide pigment for use in paper laminate are sufficient in scope and suitable to remove the significant impediment to effective competition identified by the Commission.

11. CONDITIONS AND OBLIGATIONS

(622) Pursuant to the first sentence of the second subparagraph of Article 8(2) of the Merger Regulation, the Commission may attach to its decision conditions and obligations intended to ensure that the undertakings concerned comply with the commitments they have entered into vis-à-vis the Commission with a view to rendering the concentration compatible with the internal market.

(623) The fulfilment of a measure that gives rise to a structural change of the market is a condition, whereas the implementing steps which are necessary to achieve that result are generally obligations on the parties. Where a condition is not fulfilled, the Commission's decision declaring a concentration compatible with the internal market and the EEA Agreement no longer stands. Where the undertakings concerned commit a breach of an obligation, the Commission may revoke the clearance decision in accordance with Article 8(6)(b) of the Merger Regulation. The undertakings concerned may also be subject to fines and periodic penalty payments under Articles 14(2) and 15(1) of the Merger Regulation.

(624) The full text of the Final Commitments is set out in the Annex to this Decision and forms an integral part of this Decision. In accordance with the distinction between

conditions and obligations described in the previous recital, this Decision should be made conditional on full compliance by the Notifying Party with the requirements set out in Section B of the Final Commitments (including the Schedules), which should constitute conditions. The remaining requirements set out in the other Sections of the Final Commitments should be obligations within the meaning of Article 8(2) of the Merger Regulation and should be imposed on Tronox,

HAS ADOPTED THIS DECISION:

Article 1

The notified concentration whereby Tronox Limited acquires sole control of the titanium dioxide business of The National Titanium Dioxide Company Ltd within the meaning of Article 3(1)(b) of the Merger Regulation is hereby declared compatible with the internal market and the EEA Agreement.

Article 2

Article 1 is subject to compliance with the conditions set out in Section B of the Annex, (including the Schedule, and Annexes 1 and 2).

Article 3

Tronox Limited shall comply with the obligations set out in the remaining sections of the Annex and not referred to in Article 2.

Article 4

This Decision is addressed to:

Tronox Limited
263 Tresser Boulevard, Suite 1100
CT 06901 - Stamford
United States of America

Done at Brussels, 4.7.2018

For the Commission

(Signed)
Margrethe VESTAGER
Member of the Commission

May 31, 2018

European Commission
DG Competition
Place Madou
1210 BRUSSELS

CASE COMP/M.8451 – TRONOX/CRISTAL

COMMITMENTS TO THE EUROPEAN COMMISSION

Pursuant to Article 8(2), of Council Regulation (EC) No 139/2004 (the "Merger Regulation"), Tronox Limited ("Tronox") and The National Titanium Dioxide Company Ltd. ("Cristal") (the "Parties") hereby propose to enter into the following proposed Commitments (the "Commitments") vis-à-vis the European Commission (the "Commission") with a view to rendering the acquisition of the titanium dioxide ("TiO_2") business of Cristal by Tronox (the "Concentration") compatible with the internal market and the functioning of the EEA Agreement.

This text shall be interpreted in light of the Commission's decision pursuant to Article 8(2) of the Merger Regulation to declare the Concentration compatible with the internal market and the functioning of the EEA Agreement (the "Decision"), in the general framework of European Union law, in particular in light of the Merger Regulation, and by reference to the Commission Notice on remedies acceptable under Council Regulation (EC) No 139/2004 and under Commission Regulation (EC) No 802/2004 (the "Remedies Notice").

SECTION A. DEFINITIONS

1. For the purpose of the Commitments, the following terms shall have the following meaning:

Affiliated Undertakings: undertakings controlled by the Parties and/or by the ultimate parents of the Parties (including Cristal, which will be controlled by Tronox after the consummation of the Concentration), whereby the notion of control shall be interpreted pursuant to Article 3 of the Merger Regulation and in light of the Commission Consolidated Jurisdictional Notice under Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings (the "Consolidated Jurisdictional Notice").

Assets: the assets that contribute to the current operation or are necessary to ensure the viability and competitiveness of the Divestment Business as indicated in Section B, paragraphs 5(a) to (f) and described more in detail in the Schedule.

Closing: the transfer of the legal title to the Divestment Business to the Purchaser.

Closing Period: the period of […] from the approval of the Purchaser and the terms of sale by the Commission.

Confidential Information: any business secrets, know-how, commercial information, or any other information of a proprietary nature that is not in the public domain.

Conflict of Interest: any conflict of interest that impairs the Monitoring Trustee's objectivity and independence in discharging its duties under the Commitments.

Cristal: The National Titanium Dioxide Company Ltd., also known as Cristal, is a company headquartered at Sari Street, Al Rabwah district, Jeddah 21414, in the Kingdom of Saudi Arabia.

Customer(s): Tronox's paper laminate customers that have purchased grade 8120 from Tronox between 2013 and the Closing, excluding distributors that have purchased only off-spec products during this period.

Divestment Business: the business or businesses as defined in Section B and in the Schedule which Tronox commits to divest.

Effective Date: the date of adoption of the Decision.

Employees: (i) a Tronox sales employee with paper laminate market and customer knowledge related to paper laminate market; and (ii) a Tronox employee with product/applications knowledge and customer technical service knowledge related to TiO_2 pigment production for paper laminate use.

Hold Separate Manager: the person appointed by Tronox for the Divestment Business to manage the day-to-day business under the supervision of the Monitoring Trustee.

Monitoring Trustee: one or more natural or legal person(s) who is/are approved by the Commission and appointed by Tronox, and who has/have the duty to monitor Tronox's compliance with the conditions and obligations attached to the Decision.

Purchaser: Venator Materials PLC, incorporated under the laws of England and Wales, having its principal executive offices at Titanium House, Hanzard Drive, Wynyard Park, Stockton-On-Tees, TS22, 5FD, United Kingdom, or its subsidiary.

Purchaser Criteria: the criteria laid down in paragraph 13 of these Commitments that the Purchaser must fulfil in order to be approved by the Commission.

Schedule: the schedule to these Commitments describing more in detail the Divestment Business.

Tronox: Tronox Limited is a company incorporated under the laws of State of Western Australia, with its registered office at 263 Tresser Boulevard, Suite 1100 Stamford, CT 06901, United States.

Trustee(s): the Monitoring Trustee.

SECTION B. THE COMMITMENT TO DIVEST AND THE DIVESTMENT BUSINESS

Commitment to divest

2. Tronox commits to divest, or procure the divestiture of the Divestment Business to the Purchaser on terms of sale approved by the Commission in accordance with the procedure described in these Commitments. The divestiture of the Divestment Business shall only be consummated if, and after, the Concentration is consummated. The Closing of the sale of the Divestment Business shall take place within the Closing Period, which the Commission may extend in response to a request from Tronox or, in appropriate cases, on its own initiative. In the event that the Concentration lapses, these Commitments shall lapse.

3. In order to maintain the structural effect of the Commitments, Tronox shall, for a period of ten (10) years after Closing, not acquire, whether directly or indirectly, the possibility of exercising influence (as defined in paragraph 43 of the Remedies Notice, footnote 3) over the whole or part of the Divestment Business, unless, following the submission of a reasoned request from Tronox showing good cause and accompanied by a report from the Monitoring Trustee (as provided in paragraph 35 of these Commitments), the Commission finds that the structure of the market has changed to such an extent that the absence of influence over the Divestment Business is no longer necessary to render the Concentration compatible with the internal market. Tronox shall also, for a period of ten (10) years after Closing, not introduce and sell TiO_2 pigment grades bearing the name "8120" or the name of any predecessor grades of 8120 (including 820).

4. The Concentration shall not be implemented before Tronox has entered into a final binding sale and purchase agreement for the sale of the Divestment Business and the Commission has approved the purchaser and the terms of sale in accordance with paragraph 13.

Structure and definition of the Divestment Business

5. The Divestment Business consists of the global 8120 business operated by Tronox. The Divestment Business, described in more detail in the Schedule, includes all assets that contribute to the current operation or are necessary to ensure the viability and competitiveness of the Divestment Business, in particular:

   (a) all intangible assets (including Exclusively Used Technology and the Licenced Technology);

   (b) all licences, permits and authorisations issued by any governmental organisation for the benefit of the Divestment Business;

(c) all contracts, leases, commitments and Customer orders of the Divestment Business; all Customer, credit and other records of the Divestment Business;

(d) Employees, if required by the Purchaser and subject to applicable local employment legislation;

(e) a technical services agreement (the "Technical Services Agreement") for the provision by Tronox or Affiliated Undertakings of the necessary technical support and training for the implementation of the transferred and licensed know-how in the production plants of the Purchaser and of the necessary support for the production of 8120 for a transitional period of up to […] after Closing on the terms set out in the Schedule. This agreement can be extended by the Commission for up to […] (*i.e.*, up to […] in total), as set out in the Schedule; and

(f) a transitional supply agreement (the "Transitional Supply Agreement") for 8120 produced at Tronox's Botlek plant, for a transitional period of up to […] after Closing on the terms set out in the Schedule. This agreement can be extended by the Commission for up to […] (*i.e.*, up to […] in total), as set out in the Schedule.

6. Strict firewall procedures will be adopted so as to ensure that any competitively sensitive information related to, or arising from these transitional arrangements (for example, product roadmaps) will not be shared with, or passed on to, anyone, other than for the manufacture and supply of 8120 under the Transitional Supply Agreement.

SECTION C. RELATED COMMITMENTS

Preservation of viability, marketability and competitiveness

7. From the Effective Date until Closing, Tronox shall preserve or procure the preservation of the economic viability, marketability and competitiveness of the Divestment Business, in accordance with good business practice, shall minimise as far as possible any risk of loss of competitive potential of the Divestment Business, and shall use reasonable best efforts to complete the transfer of the Divestment Business. In particular Tronox undertakes:

(a) not to carry out any action that might have a significant adverse impact on the value, management or competitiveness of the Divestment Business or that might alter the nature and scope of the activity, or the industrial or commercial strategy or the investment policy of the Divestment Business;

(b) to make available, or procure to make available, sufficient resources for the development of the Divestment Business, on the basis and continuation of the existing business plans;

(c) to take any reasonable steps to encourage Customers to move their 8120 purchasing volumes to the Purchaser; and

(d) if required by the Purchaser, to take all reasonable steps, or procure that all reasonable steps are being taken, including appropriate incentive schemes (based on industry practice), to encourage Employees to remain with the Divestment Business, and not to solicit or move the Employees to Tronox's remaining business. Where, nevertheless, the Employees exceptionally leaves the Divestment Business and the Purchaser so requests, Tronox shall provide a reasoned proposal to replace the person to the Commission and the Monitoring Trustee. Tronox must be able to demonstrate to the Commission that the replacement is well suited to carry out the functions exercised by Employees. The replacement shall take place under the supervision of the Monitoring Trustee, who shall report to the Commission.

Hold-separate obligations

8. Tronox commits, from the Effective Date until Closing, to procure that the Divestment Business is kept separate from the businesses that Tronox will be retaining and, after closing of the Concentration to keep the Divestment Business separate from the business that Tronox is retaining and to ensure that unless explicitly permitted under these Commitments the Employees (if required by the Purchaser) have no involvement in any business retained by Tronox and do not report to any individual outside the Divestment Business.

9. Until Closing, Tronox shall assist the Monitoring Trustee in ensuring that the Divestment Business is kept as a distinct and saleable entity separate from the businesses which Tronox is retaining. Tronox shall appoint a Hold Separate Manager who shall be responsible for the management of the Divestment Business, under the supervision of the Monitoring Trustee. The Hold Separate Manager shall manage the Divestment Business independently and in the best interest of the business with a view to ensuring its continued economic viability, marketability and competitiveness and its independence from the businesses retained by Tronox.

Ring-fencing

10. Tronox shall implement, or procure to implement, all necessary measures to ensure that it does not, after the Effective Date, obtain any Confidential Information relating to the Divestment Business and that any such Confidential Information obtained by Tronox before the Effective Date will be eliminated and not be used by Tronox. In particular, the participation of the Divestment Business in any central information technology network shall be severed to the extent possible, without compromising the viability of the Divestment Business. Tronox may obtain or keep information relating to the Divestment Business which is reasonably necessary for the divestiture of the Divestment Business (and the implementation of the Technical Services Agreement and the Transitional Supply Agreement) or the disclosure of which to Tronox is required by law.

Non-solicitation clause

11. If required by the Purchaser, Employees remain with the Divestment Business, Tronox undertakes, subject to customary limitations, not to solicit, and to procure that Affiliated Undertakings do not solicit the Employees transferred with the Divestment Business for a period […] after Closing.

Due diligence

12. In order to enable the Purchaser to carry out a reasonable due diligence of the Divestment Business, Tronox shall, subject to customary confidentiality assurances and dependent on the stage of the divestiture process:

    (a) provide to the Purchaser sufficient information as regards the Divestment Business;

    (b) if required by the Purchaser, provide to the Purchaser sufficient information relating to the Employees and allow it reasonable access to the Employees.

SECTION D. THE PURCHASER

13. In order to be approved by the Commission, the Purchaser must fulfil the following criteria:

    (a) The Purchaser shall be independent of and unconnected to Tronox and its Affiliated Undertakings (this being assessed having regard to the situation following the divestiture).

    (b) The Purchaser shall have the financial resources, proven expertise, TiO_2 quality track record in chloride-based technology, and incentive to complete the technology transfer to one of its chloride-based plants by the end of the Technical Support Period and to maintain and develop the Divestment Business as a viable and active competitive force in competition with the Parties and other competitors in the EEA;

    (c) The acquisition of the Divestment Business by the Purchaser must neither be likely to create, in light of the information available to the Commission, prima facie competition concerns nor give rise to a risk that the implementation of the Commitments will be delayed. In particular, the Purchaser must reasonably be expected to obtain all necessary approvals from the relevant regulatory authorities for the acquisition of the Divestment Business;

    (d) The Purchaser shall, within 24 months after Closing, have sufficient chloride based TiO_2 capacity and scope to meet current and reasonably foreseeable demand to replicate Tronox's 8120 competitive position in the EEA;

    (e) The Purchaser shall provide the Commission with a business plan to develop the Divestment Business in the EEA; and

(f) The Purchaser shall have, or reasonably be expected to have within the transitional timeframe, the ability to distribute 8120 in the EEA or to have procured such services from a third party.

14. The final binding sale and purchase agreement (as well as ancillary agreements) relating to the divestment of the Divestment Business shall be conditional on the Commission's approval. When Tronox has reached an agreement with the Purchaser, it shall submit a fully documented and reasoned proposal, including a copy of the final agreement(s), within one week to the Commission and the Monitoring Trustee. Tronox must be able to demonstrate to the Commission that the purchaser fulfils the Purchaser Criteria and that the Divestment Business is being sold in a manner consistent with the Commission's Decision and the Commitments. For the approval, the Commission shall verify that the purchaser fulfils the Purchaser Criteria and that the Divestment Business is being sold in a manner consistent with the Commitments including their objective to bring about a lasting structural change in the market. The Commission may approve the sale of the Divestment Business without one or more Assets or Employees, or by substituting one or more Assets with one or more different assets, if this does not affect the viability and competitiveness of the Divestment Business after the sale, taking account of the proposed purchaser.

SECTION E. TRUSTEE

I. Appointment procedure

15. Tronox shall appoint a Monitoring Trustee to carry out the functions specified in these Commitments for a Monitoring Trustee. Tronox commits not to close the Concentration before the appointment of a Monitoring Trustee.

16. The Trustee shall:

(a) at the time of appointment, be independent of the Parties and its Affiliated Undertakings;

(b) possess the necessary qualifications to carry out its mandate, for example have sufficient relevant experience as an investment banker or consultant or auditor; and

(c) neither have nor become exposed to a Conflict of Interest.

17. The Trustee shall be remunerated by Tronox in a way that does not impede the independent and effective fulfilment of its mandate.

Proposal by Tronox

18. No later than two weeks after the Effective Date, Tronox shall submit the names of at least three natural or legal persons whom Tronox proposes to appoint as the Monitoring Trustee to the Commission for approval. The proposal shall contain sufficient information for the Commission to verify that the person or persons proposed as Monitoring Trustee fulfil the

requirements set out in paragraph 16 and shall include:

(a) the full terms of the proposed mandate, which shall include all provisions necessary to enable the Monitoring Trustee to fulfil its duties under these Commitments; and

(b) the outline of a work plan which describes how the Trustee intends to carry out its assigned tasks.

Approval or rejection by the Commission

19. The Commission shall have the discretion to approve or reject the proposed Monitoring Trustee and to approve the proposed mandate subject to any modifications it deems necessary for the Monitoring Trustee to fulfil its obligations. If only one name is approved, Tronox shall appoint or cause to be appointed the person or persons concerned as Monitoring Trustee, in accordance with the mandate approved by the Commission. If more than one name is approved, Tronox shall be free to choose the Monitoring Trustee to be appointed from among the names approved. The Monitoring Trustee shall be appointed within one week of the Commission's approval, in accordance with the mandate approved by the Commission.

New proposal by Tronox

20. If all the proposed Monitoring Trustees are rejected, Tronox shall submit the names of at least two more natural or legal persons within one week of being informed of the rejection, in accordance with paragraphs 15 and 16 of these Commitments.

Monitoring Trustee nominated by the Commission

21. If all further proposed Monitoring Trustees are rejected by the Commission, the Commission shall nominate a Monitoring Trustee, whom Tronox shall appoint, or cause to be appointed, in accordance with a trustee mandate approved by the Commission.

II. Functions of the Monitoring Trustee

22. The Monitoring Trustee shall assume its specified duties and obligations in order to ensure compliance with the Commitments. The Commission may, on its own initiative or at the request of the Monitoring Trustee or Tronox, give any orders or instructions to the Monitoring Trustee in order to ensure compliance with the conditions and obligations attached to the Decision.

Duties and obligations of the Monitoring Trustee

23. The Monitoring Trustee shall:

(a) propose in its first report to the Commission a detailed work plan describing how it intends to monitor compliance with the obligations and conditions attached to the Decision.

(b) oversee, in close co-operation with the Hold Separate Manager, the on-going management of the Divestment Business with a view to ensuring its continued economic viability, marketability and competitiveness and monitor compliance by Tronox with the conditions and obligations attached to the Decision. To that end the Monitoring Trustee shall:

(i) monitor the preservation of the economic viability, marketability and competitiveness of the Divestment Business, and the keeping separate of the Divestment Business from the business retained by Tronox, in accordance with paragraphs 8 and 9 of these Commitments;

(ii) supervise the management of the Divestment Business as a distinct and saleable entity, in accordance with paragraph 7 of these Commitments;

(iii) with respect to Confidential Information and subject to the transitional agreements referred to in paragraph 2(j) of the Schedule:

- determine all necessary measures to ensure that Tronox does not after the Effective Date obtain any Confidential Information relating to the Divestment Business,
- in particular strive for the severing of the Divestment Business' participation in a central information technology network to the extent possible, without compromising the viability of the Divestment Business;
- make sure that any Confidential Information relating to the Divestment Business obtained by Tronox before the Effective Date is eliminated

and will not be used by Tronox (except that Tronox may use the Licenced Technology to manufacture grades other than 8120); and

- decide whether such information may be disclosed to or kept by Tronox as the disclosure is reasonably necessary to allow Tronox to carry out the divestiture or as the disclosure is required by law;

(c) monitor the splitting of assets listed in Confidential Annex between the Divestment Business and Tronox or Affiliated Undertakings where applicable;

(d) propose to Tronox such measures as the Monitoring Trustee considers necessary to ensure Tronox's compliance with the conditions and obligations attached to the Decision, in particular the maintenance of the full economic viability, marketability or competitiveness of the Divestment Business, the holding separate of the Divestment Business and the non- disclosure of competitively sensitive information;

(e) provide to the Commission, sending Tronox a non-confidential copy at the same time, a written report within 15 days after the end of every month that shall cover the operation and management of the Divestment Business as well as the splitting of assets so that the Commission can assess whether the business is held in a manner consistent with the Commitments;

(f) promptly report in writing to the Commission, sending Tronox a non-confidential copy at the same time, if it concludes on reasonable grounds that Tronox is failing to comply with these Commitments;

(g) within one week after receipt of the documented proposal referred to in paragraph 14 of these Commitments, submit to the Commission, sending Tronox a non-confidential copy at the same time, a reasoned opinion as to the suitability and independence of the Purchaser and the viability of the Divestment Business after the divestiture and as to whether the Divestment Business is sold in a manner consistent with the conditions and obligations attached to the Decision, in particular, if relevant, whether the divestiture of the Divestment Business without one or more Assets or Employees affects the viability of the Divestment Business after the divestiture, taking account of the proposed purchaser;

(h) assume the other functions assigned to the Monitoring Trustee under the conditions and obligations attached to the Decision.

III. Duties and obligations of Tronox

24. Tronox shall provide and shall cause its advisors to provide the Monitoring Trustee with all such co-operation, assistance and information as the Monitoring Trustee may reasonably require to perform its tasks. The Monitoring Trustee shall have full and complete access to any of Tronox's or the Divestment Business' books, records, documents, management or other personnel, facilities, sites and technical information necessary for fulfilling its duties under the Commitments and Tronox and the Divestment

Business shall provide the Monitoring Trustee upon request with copies of any document. Tronox and the Divestment Business shall make available to the Monitoring Trustee one or more offices on their premises and shall be available for meetings in order to provide the Monitoring Trustee with all information necessary for the performance of its tasks.

25. Tronox shall provide the Monitoring Trustee with all managerial and administrative support that it may reasonably request on behalf of the management of the Divestment Business. This shall include all administrative support functions relating to the Divestment Business which are currently carried out at headquarters level. Tronox shall provide and shall cause its advisors to provide the Monitoring Trustee, on request, with the information submitted to the Purchaser, in particular give the Monitoring Trustee access to the data room documentation and all other information granted to the Purchasers in the due diligence procedure. Tronox shall keep the Monitoring Trustee informed of all developments in the divestiture process.

26. Tronox shall indemnify the Monitoring Trustee and its employees and agents (each an "Indemnified Party") and hold each Indemnified Party harmless against, and hereby agrees that an Indemnified Party shall have no liability to Tronox for, any liabilities arising out of the performance of the Monitoring Trustee's duties under the Commitments, except to the extent that such liabilities result from the willful default, recklessness, gross negligence or bad faith of the Monitoring Trustee, its employees, agents or advisors.

27. At the expense of Tronox, the Monitoring Trustee may appoint advisors (in particular for corporate finance or legal advice), subject to Tronox's approval (this approval not to be unreasonably withheld or delayed) if the Monitoring Trustee considers the appointment of such advisors necessary or appropriate for the performance of its duties and obligations under the Mandate, provided that any fees and other expenses incurred by the Monitoring Trustee are reasonable. Should Tronox refuse to approve the advisors proposed by the Monitoring Trustee the Commission may approve the appointment of such advisors instead, after having heard Tronox. Only the Monitoring Trustee shall be entitled to issue instructions to the advisors. Paragraph 23 of these Commitments shall apply *mutatis mutandis*.

28. Tronox agrees that the Commission may share Confidential Information proprietary to Tronox with the Monitoring Trustee. The Monitoring Trustee shall not disclose such information and the principles contained in Article 17 (1) and (2) of the Merger Regulation apply *mutatis mutandis*.

29. Tronox agrees that the contact details of the Monitoring Trustee are published on the website of the Commission's Directorate-General for Competition and shall inform interested third parties of the identity and the tasks of the Monitoring Trustee.

30. For a period of ten (10) years from the Effective Date the Commission may request all information from Tronox that is reasonably necessary to monitor the effective implementation of these Commitments.

IV. Replacement, discharge and reappointment of the Monitoring Trustee

31. If the Monitoring Trustee ceases to perform its functions under the Commitments or for any other good cause, including the exposure of the Monitoring Trustee to a Conflict of Interest:

(a) the Commission may, after hearing the Monitoring Trustee and Tronox, require Tronox to replace the Monitoring Trustee; or

(b) Tronox may, with the prior approval of the Commission, replace the Monitoring Trustee.

32. If the Monitoring Trustee is removed according to paragraph 31 of these Commitments, the Monitoring Trustee may be required to continue in its function until a new Monitoring Trustee is in place to whom the Monitoring Trustee has effected a full hand over of all relevant information. The new Monitoring Trustee shall be appointed in accordance with the procedure referred to in paragraphs 15 – 21 of these Commitments.

33. Unless removed according to paragraph 31 of these Commitments, the Monitoring Trustee shall cease to act as Monitoring Trustee only after the Commission has discharged it from its duties after all the Commitments with which the Monitoring Trustee has been entrusted have been implemented. However, the Commission may at any time require the reappointment of the Monitoring Trustee if it subsequently appears that the relevant remedies might not have been fully and properly implemented.

SECTION F. THE REVIEW CLAUSE

34. The Commission may extend the time periods foreseen in the Commitments in response to a request from Tronox or, in appropriate cases, on its own initiative. Where Tronox requests an extension of a time period, it shall submit a reasoned request to the Commission no later than one month before the expiry of that period, showing good cause**.** This request shall be accompanied by a report from the Monitoring Trustee, who shall, at the same time send a non-confidential copy of the report to Tronox. Only in exceptional circumstances shall Tronox be entitled to request an extension within the last month of any period.

35. The Commission may further, in response to a reasoned request from Tronox showing good cause waive, modify or substitute, in exceptional circumstances, one or more of the undertakings in these Commitments. This request shall be accompanied by a report from the Monitoring Trustee, who shall, at the same time send a non-confidential copy of the report to Tronox. The request shall not have the effect of suspending the application of the undertaking and, in particular, of suspending the expiry of any time period in which the undertaking has to be complied with.

SECTION G. ENTRY INTO FORCE

36. The Commitments shall take effect upon the date of adoption of the Decision.

……
duly authorised for and on behalf of
TRONOX Limited

SCHEDULE

1. The Divestment Business as operated to date has the following legal and functional structure:

1. The Divestment Business consists of the global 8120 business operated by Tronox.

2. In accordance with paragraph 5 of these Commitments, the Divestment Business comprises of:

   (a) the assignment of all of Tronox's and its Affiliated Undertakings' 8120 know-how that is used by Tronox and its Affiliated Undertakings exclusively to manufacture Tronox's and its Affiliated Undertakings' 8120 product and intellectual property rights, if any, in such know-how (the "Exclusively Used Technology" as detailed in Confidential Annex). For the avoidance of doubt, following the assignment, Tronox will not be able to use the Exclusively Used Technology (other than pursuant to the Transitional Supply Agreement with the Purchaser), particularly for the finishing steps specific to the 8120 grade;

   (b) a royalty-free, irrevocable, non-exclusive, global license under Tronox's other intellectual property rights, if any, to use all know-how currently used by Tronox to manufacture 8120 but which is also used on other grades, in each case solely for the manufacture for paper laminate applications (the "Licenced Technology" as detailed in Confidential Annex);

   (c) a list of all Customers for 8120 for the time period between 2013 and Closing, as well as, where applicable, the assignment of any supply arrangements, contracts, contract rights, Customer records, Customer reports, transactional data, Customer accreditations and other Customer documentation for the time period between 2013 and Closing which contribute to the current operation or are necessary to ensure the viability and competitiveness of, the Divestment Business provided however, that Tronox shall not be required to transfer any such supply arrangements, contracts, contract rights, customer records, customer reports, transactional data, customer accreditations or other customer documentation that do not form part of the Divestment Business. Tronox and its Affiliates will take any reasonable steps to encourage Customers to move their 8120 purchasing volumes to the Purchaser.

   (d) to the extent applicable, the transfer of all licences, permits and authorisations issued by any governmental organisation which contribute to the current operation or are necessary to ensure the viability and competitiveness of, the Divestment Business;

   (e) to the extent applicable, the transfer of all licences, permits, authorisations and agreements under or pursuant to which Tronox or its affiliates use any information and know-how owned by any third party to develop, manufacture,

sell and use Tronox's and its affiliates' 8120 product;

(f) to the extent applicable, the transfer of: (i) all records of Customers and suppliers, price lists, catalogues and mailing lists related to the Divestment Business; (ii) all advertising, marketing, sales, publicity and presentational materials related to the Divestment Business, or copies thereof for the time period between 2013 and the Closing; and (iii) reports about top quality detractors of 8120 pigment;

(g) any 8120 inventory existing at the time of Closing, which would be held separate and sold over time to the Purchaser under the terms of the Transitional Supply Agreement;

(h) the goodwill of Tronox related to the Divestment Business, including the exclusive right for the Purchaser to represent itself as carrying on the Divestment Business in succession to Tronox;

(i) Employees, if required by the Purchaser and subject to applicable local employment legislation and to the consent of these Employees, provided that Tronox and its Affiliates will take any reasonable steps, including implementing appropriate incentive schemes (based on industry practice) to encourage such employees to move to the Purchaser;

(j) Tronox will enter with the Purchaser into the following arrangements which will be subject to customary confidentiality restrictions:

(i) A Technical Services Agreement for the provision by Tronox or Affiliated Undertakings of necessary technical support and training for the implementation of the transferred and licensed know-how in the production plants of the Purchaser for a transitional period of up to […] (the "Technical Support Period") after Closing, including technical service assistance in the technical qualification of the licensed products with Customers. The Commission may, upon the request of the Purchaser and after consultation with the Monitoring Trustee, extend this agreement and the Technical Support Period for a time not exceeding […] if in the judgment of the Commission, the need for an extension did not come as a result of Purchaser's failure to use reasonable best efforts to complete the transfer. In exceptional circumstances, the Commission may, upon the request of the Purchaser and after consultation with the Monitoring Trustee, extend the term of the Technical Services Agreement and the Technical Support Period for an additional time not exceeding […] (*i.e.*, to up to […] in total) if in the judgment of the Commission, the need for an extension did not come as a result of Purchaser's failure to use reasonable best efforts to complete the transfer. During the Technical Support Period, Tronox and Affiliated Undertakings shall provide the Purchaser with necessary support for the production of 8120, it being understood that where modifications are required to the Purchaser's plant to manufacture

8120, such necessary support shall include, but not be limited to, making available to the Purchaser equipment specifications for equipment needed to manufacture 8120, flow sheets associated with 8120 modifications, process and instrumentation diagrams associated with 8120 specific modifications, and risk studies related to applying phosphoric acid and potassium nitrate at the finishing stage of 8120 production, but will not include financial support. If required by the Purchaser, Tronox shall also provide the Purchaser free of charge with the necessary support for sourcing and adapting the necessary equipment for the production and testing of 8120 (including storage tanks, oxidization equipment, testing equipment) and for procuring logistics and distribution services for the distribution of 8120; and

(ii) A Transitional Supply Agreement for 8120 produced at Tronox's Botlek plant, for the Technical Support Period (as extended, if at all, according to paragraph 2(j)(i) above), at current quality and quantity levels or quantities that reflect *bona fide* changes in customer demand, including demand from new customers. Tronox shall supply up to a maximum amount of […] metric tons per annum of grade 8120, all as overseen by the Monitoring Trustee.

A. Tronox shall supply grade 8120 at incremental costs of: .[1]On a […] basis […], the incremental costs set forth above shall be adjusted [for changes in input costs on the basis of external indices][2][…].

B. If Tronox's annual production (for Botlek, Hamilton, and Kwinana) is equal to or exceeds […] the price of one metric ton of 8120 shall be equal to the sum of: the incremental costs […] ***plus*** […][3][…].

C. For each tonne that Tronox's annual production (for Botlek, Hamilton and Kwinana) is […].

D. In the event of any dispute between Tronox and the Purchaser regarding the price of 8120, the matter shall be referred to the Monitoring Trustee for resolution. To resolve any such dispute, the Monitoring Trustee shall have the option to appoint an expert, if required, the cost of which will be borne by Tronox.

3. The Divestment Business shall not include:

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1 […].

2 […].

3 […].

(a) any right to any of Tronox's manufacturing or other facilities;

(b) any of Cristal's grades and any of Tronox's grades other than 8120 which Tronox will continue to manufacture, sell and use.

4. If there is any asset which is not covered by paragraph 2 of this Schedule but which is both used (exclusively or not) in the Divestment Business and is necessary for the continued viability and competitiveness of the Divestment Business, that asset or adequate substitute will be offered to the Purchaser, unless excluded by paragraph 3 of this Schedule.

ANNEX 1

Description of the Exclusively Used Technology and of the Licensed Technology

[Confidential]

ANNEX 2

[Confidential]