The Cobalt Development Institute (The CDI) is an industry association which represents a large proportion of the global cobalt market. We promote the responsible manufacture, production, use, trade and recycling of cobalt in all its forms. In the EU, the CDI Board has established three REACH Consortia for registration of cobalt compounds. Five cobalt substances have legal classifications as CMRs (Carc 1B, Repro 1B, Muta 2), and have been identified as SVHCs on the REACH Candidate List. These same ‘five cobalt salts’, namely cobalt sulphate, cobalt dichloride, cobalt acetate, cobalt carbonate and cobalt nitrate, are listed as “other substances” in the background documentation provided for this particular consultation by the European Commission (EC).

The CDI has recently re-examined and updated its knowledge on the uses of the five cobalt salts in different sectors of the textile industry by contacting representatives of several sector groups, including dyestuffs (ETAD\(^1\)), non-wovens (EDANA\(^2\)), man-made fibres (CIRFS\(^3\)), printing inks (CEPE\(^4\)) and polyethylene terephthalate (PET) manufacturers (CPME\(^5\)). Of the five cobalt compounds on the ‘other substances’ list, The CDI can only find evidence of uses in the textiles industry for cobalt sulphate, cobalt dichloride and cobalt acetate. These three cobalt compounds are used as intermediates in the manufacture of metal-complex dyes. Cobalt acetate is also used as a catalyst in the synthesis of purified terephthalic acid (PTA), which is a precursor in the manufacture of PET or polyester resin (used in fibres for clothing), cobalt acetate is also used as a colourant for PET outside of Europe. The CDI has not found any uses for cobalt carbonate or cobalt nitrate in the textile industry. The specific uses of the three cobalt compounds in the textile industry are further described later in the document (page three).

**General comments on the EC public consultation**

The CDI has the following general comments relating to the EC public consultation on textiles:

**Lack of regulatory efficiency**

The five cobalt salts on the REACH Candidate List have previously been prioritised for Authorisation. ECHA however, is currently conducting specific investigation studies to identify the risks related to the uses of the five cobalt salts. The result of these studies will be used to determine the most adequate risk management option (RMO) for certain uses of these compounds. The expected timeframe for this EC decision is the end of 2016/beginning of 2017. The current consultation for a fast-track restriction, which includes the five cobalt salts, therefore appears to contradict the more extensive work

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\(^1\) ETAD = The Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers

\(^2\) EDANA = Trade Association for the Non-woven Industry

\(^3\) CIRFS = European Man-made Fibres Association

\(^4\) CEPE = Paints, Printing Inks and Artists’ Colours in Europe

\(^5\) CPME = The Committee of PET Manufacturers in Europe
programme that is currently being conducted by ECHA, by pre-emptively fast-tracking an RMO for a specific industry sector. Moreover such an overlap of regulatory measures could become confusing for the companies and manufacturers to follow.

None of the proposed listed cobalt substances (five cobalt salts) are found in the final textile articles

None of the cobalt compounds on the “other substances” list for this consultation are found in the final textile article. Although cobalt sulphate, cobalt acetate and cobalt chloride are used in the manufacturing process of cobalt dyes, the cobalt ion disassociates from the salt and forms a complex with another chemical moiety. In the synthesis of PET, cobalt acetate is used as a catalyst for the creation of PTA. There is no presence of cobalt acetate in the final textile product as the cobalt ion forms a complex with the terephthalate moiety. Even in imported PET, where cobalt acetate is intentionally added for purpose of colourant, it is unlikely that any ‘cobalt acetate’ is found in the final textile.

The CDI has not found any uses for cobalt carbonate or cobalt nitrate in the textile industry, neither in the dye manufacturing process nor in the synthesis of PTA, and therefore we question why these two cobalt substances appear on the “other substances” list in this consultation.

Potential misuse of the fast-track Restriction procedure

The use of a fast-track Restriction procedure to prevent exposure of a substance of high concern to the public is a system that the CDI agrees with in principle. Indeed, if conducted diligently, it could capture all the substances used in an application (e.g. textiles) and should therefore create a level-playing field. However, the CDI remains concerned about the current approach of fast-tracking restrictions for specific sectors for future similar consultations as currently they do not include sufficient consideration of risk or socio-economic assessment. For example the scope of the substances proposed may be incorrect (as in the case of cobalt compounds), and the rational for proposing a generalised limit of 50 ppm for all substances appears unclear. By not treating each chemical on an individual-basis with appropriate science-based limits, there is a risk of a ‘generic’ safety limit being set that inadvertently and significantly impacts upon the textile industry. On the contrary a higher risk substance may be “missed out” due to the limit being set too high. In addition, as the limit would be EU based only, companies may decide to manufacture their dyes outside of the EU, and instead import the dyes and polyester material or fibre.

The uses of cobalt compounds in the textile industry are already well controlled under the existing voluntary industry standards. The industry representatives contacted, indicated they were not aware of cobalt compounds being found over 50ppm in textiles which suggests that the public are not going to be any better protected by this proposed ‘fast-track’ restriction than they are at present. The fast-track system should instead be used for known instances where there is an identified significant risk to the public caused by a measured high exposure to a dangerous chemical.
1. **Dyes for textile articles**

Cobalt salts are not present in textile dyes

The CDI has contacted ETAD with regards to both the use of the five cobalt salts in the manufacturing process of dyes and the final presence of cobalt compounds in the finished textile article. Only three of the five proposed cobalt salts (cobalt sulphate, cobalt dichloride, and some cobalt acetate) are used as the starting material for the synthesis of dye compounds used in textiles. During the synthesis of these dyes the cobalt salt used is entirely converted into 2:1 metal complex dye whereby two dye molecules are attached to a single metal atom.

During the manufacturing process, the cobalt (II) salt becomes oxidised to cobalt (III), forming a complex with the dye compounds. There is thus no presence of any of the three above-mentioned cobalt salts in the final dye. In addition, the cobalt is strongly bound in the metal complex dye and therefore cannot easily disassociate and be released.

In the past 25 years, the production of dyes in the United States, Western Europe and Japan has decreased significantly, while production in Asian countries, particularly in China, India, Thailand and Indonesia, has increased\(^6\). Inside the EU, Italy represents the largest producer of dyes. The use of metal complex dyes has sharply reduced in the textile industry and many existing schemes prevent their continued use. There are currently only some 25 cobalt complex dyes on the market (compared to hundreds of organic dyes), of which only one had a high enough tonnage (> 100 tpa) for the REACH 2013 registration deadline. Depending on the burden of cost and workload on EU industry for the manufacture of the remaining dyes, the upcoming 2018 REACH deadline will show whether the manufacture of these dyes is continuing at all in the EU.

Any residual impurities of cobalt in textile dyes are already controlled by existing standards

Although there is no presence of any initial cobalt salts in the final dye, the cobalt metal ion may be found as an impurity in the dye. The production process of cobalt-based metal complex dyes is optimized to minimise the presence of non-complexed cobalt in the final product. A first approximation of the extractable cobalt content in textile dyed with complex dyes can be done using as a reference the cobalt limit of 500 ppm recommended by ETAD and recently adopted by ZDHC\(^7\). When dyeing a textile, the concentrations of dye used are between 0.1 and 3%. By taking a worst case scenario where there is a presence of non-complexed cobalt in the dye at the maximum limit of 500ppm and the article of clothing uses a dye of 4% concentration, the maximum amount of extractable cobalt present in the final textile would be estimated as 500 ppm x 0.04 = 20ppm extractable cobalt in the textile.

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\(^7\) ZDHC = Zero Discharge Hazardous Chemical Group
In practice, the final concentration of cobalt is likely to be far less than 20ppm. In the many existing textile standards the level of allowed cobalt as extractable impurity in the textiles is much lower than 20 ppm, and complex dyes are manufactured in a purity which will comply with such requirements. As an example, the Global Organic Textiles Standard (GOTS) state:

“They [GOTS] have not heard about any problems from certifiers or certified entities about any cobalt contamination in dyes above the ETAD level of 500ppm which we take as ‘heavy metal free level’ or above 1ppm in eluate testing of textile products”

The analysis of free metals in textiles is performed according to standardised methods: DIN EN ISO 105-E04 for the elution, ISO 17294-2 (using ICP/MS) for the detection. To obtain the eluate according to DIN EN ISO 105-E04, textiles are treated with a sweat simulant to mimic the effect of perspiration.

Within the textiles industry there is a wide variety of different standards used by different textile manufacturers however 95% of the manufacturers refer to the voluntary standard OEKO-TEX, an independent testing and certification system for textile raw materials, intermediates and end products at all stages of production. The OEKO-TEX standard imposes a limit of ‘extractable heavy metals’ of 1 mg cobalt/kg in textiles used in baby clothing and 4 mg cobalt/kg in textiles used in adult clothing (OEKO-TEX⁹). Such standards are met without difficulty, resulting in the exposure to the consumer being considered negligible.

Substitution is not possible for all textile dyes applications

Cobalt complex dyes can be substituted by other non-metallic dyes; however, in doing so, the desired high-performance is lost. Metal-complex dyes such as those that use cobalt have a high light-fastness which cannot be achieved by using alternative dyes. In the automobile industry for example light-fastness is an important quality to avoid the colour fading and so metal complex dyes are preferred and are still used.

2. Polyester in textile articles

In the manufacturing of polyester fibre precursors

Cobalt acetate is used as a catalyst in the manufacture of purified terephthalic acid (PTA) and Dimethyl Terephthalate (DMT), both compounds are precursors of polyethylene terephthalate (PET) or polyester resin.

During the synthesis of PTA using cobalt diacetate as a catalyst, the cobalt is transformed into a complexed form (cobalt terephthalate) which is present at a part per billion (ppb) level. There is no release of cobalt from the complex form.

PTA is then manufactured into the PET resin which is used to form the PET fibres used for textile articles. The levels of free PTA in PET (the final product that is present in textiles) are so low that they are below the limit of detection for PTA (35ppb). It is therefore very unlikely that free cobalt will be

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⁹ https://www.oekotex.com/en/manufacturers/test_criteria/limit_values/limit_values.html
The colour of PET resin used in polyester fibre is naturally yellow. Historically, cobalt acetate was added/left in the PTA to modify the colour of the PET resin. In the EU however this practice has completely ceased after a voluntary industry phase-out. In Europe the cobalt acetate is recycled during the PTA manufacturing process and non-cobalt containing dyes are used instead to correct the colour of the PET resin. Imported PET resin or PET fibre, which represents 20-25% (around 3.3 million tonnes per annum) of the PET resin in the EU, may be intentionally coloured with cobalt acetate and can contain an average of around 40ppm complexed cobalt metal. The amount (%) of cobalt extractable from the PET fibre is not known. Therefore it may be appropriate that the imported PET resin or fibres could be regulated, for example through a restriction. This step would create a level playing field between the EU manufacturers and importers of PET resin.

In summary:

- There are no identified uses of cobalt carbonate or cobalt nitrate in the textile industry
- The three other cobalt salts (cobalt sulphate, cobalt dichloride, and cobalt acetate) may be used in the two following ways:
  - **In the manufacture of textile dyes:**
    - Cobalt sulphate, cobalt dichloride, and some cobalt acetate are used as intermediates. They are completely converted into a metal-complex from which the cobalt cannot be released. Therefore these three cobalt salts are not present in the final textile dye.
  - **In the manufacture of PET:**
    - Cobalt acetate is used as a catalyst in the manufacture of PTA and DMT, both precursors of the polyester resin (PET) found in polyester textiles. The cobalt acetate is converted into a complexed form from which Co cannot be released. The Cobalt complex in the PET is already below the limit of detection (ppb) and therefore cobalt will also not be detectable in the final textile product.
    - Imported PET resin/fibre, which is intentionally coloured using cobalt acetate to mask its yellow colour, can contain an average of 40ppm cobalt. This use has been phased out for PET resin/fibre manufactured in the EU.

- In general The CDI approves of the use of a fast track procedure to prevent public exposure to substances of a very high concern (SVHC). Several factors may need to be considered further however. Such factors include lack of consideration of socio-economic assessment, generalised 50ppm limit, possible overlap in regulations and substances being selected that are either not present at all or in minute concentrations, unlikely to cause safety concerns to the public.