

Clariant GmbH - Business Unit Plastic Industries

www.exolit.com

Am Unisys Park 1
D-65840 Sulzbach

Dr. Rüdiger Walz

Ph: +49 6196 757 8109

Fx: +49 6196 757 8977

Ruediger.Walz @ Clariant.com

Dr. Adrian Beard

Ph: +49 2233 48 6114

Fx: +49 2233 41236

Adrian.Beard @ Clariant.com

Stakeholder Consultation for 2002/95/EC (RoHS) on Deca-BDE

4. CONSULTATION OF INTERESTED PARTIES

In preparation of the decision for the consideration of item 10 of the annex as published, and the items listed above based on Article 5(1) (b), the Commission services would like to consult interested parties.

In particular, stakeholders are requested to provide, for each entry, information on the existence of feasible substitutes currently existing in an industrial and/or commercial scale, and the costs and benefits and advantages and disadvantages of such a substitute. For each item, any feasible substitutes should be identified and any restrictions that apply to this substitute. Stakeholders are requested to support, as far as possible, their contribution with technical and scientific evidence.

1. Deca-BDE

a) Do feasible substitutes currently exist in an industrial and / or commercial scale?

Clariant corporation has developed a new class of phosphorus based flame retardants, alkyl phosphinic acid salts marketed under the trade name Exolit® OP, which are very effective flame retardants for engineering plastics like polyamides and polybutylene terephthalate. We have built a new plant for producing the phosphinates at our Knapsack site near Cologne, Germany. The plant will go on stream and produce commercial quantities by October 2004 with an annual capacity of several thousand tons. Until now, a pilot plant has produced several hundred tons of this new material which a number of customers have tested positively. These

Exolit phosphinates can also be used in printed circuit boards as a substitute for e.g. tetrabromo bisphenol A.

Phosphinates are not suitable flame retardants for polyolefins and polystyrene. However, innovative flame retardant producers are developing solutions which involve research into new substances as well as the combination and improvement of established non-halogen flame retardants like ammonium polyphosphates in combination with synergists for polyolefins. For neat polystyrene there are currently no non-halogenated flame retardants available, but other base polymers can be used for the same applications albeit at slightly higher prices, e.g. co-polymers of polycarbonate and styrenics (PC-ABS) or polyphenylene oxide (PPO) and polystyrene for computer housings with phosphorus based flame retardants like aryl phosphates (not offered by Clariant).

The manufacturers of non-halogen flame retardants have experienced that offering a more environmentally friendly product is often not sufficient for market success, even if the price and technical properties are comparable to established flame retardants. Therefore, legally binding requirements together with market pull - manufacturers and consumers of end-use products demanding more environmentally friendly solutions - will encourage the development of alternative non-halogen flame retardants. Once they gain a considerable share of the market, economies of scale can materialise and lower the cost of alternatives.

The 1986 commitment of German plastics manufacturers and textiles additives association (TEGEWA) to discontinue the use PBDEs shows that legally required fire safety of products can be achieved with other solutions. The bromine industry has come up with substitutes for PBDEs like polybrominated diphenyl ethanes. However, these have been only used reluctantly, seemingly not for technical reasons, but because they are more expensive and less toxicological and environmental data are available on these.

b) Do any restrictions apply to such substitutes?

Clariant has registered the phosphinate flame retardant as a new substance under ELINCS. The substance is not classified or labelled as hazardous. Numerous physical, chemical and (eco-)toxicity data are available demonstrating the non-toxic nature of this substance. Since it is a salt, there is no concern over bioaccumulation.

Phosphinates or any phosphorus based flame retardants are not restricted by ELV, WEEE or RoHS Directives. In fact, Exolit phosphinates

comply with many ecolabel schemes, like e.g. the European ecolabel, German Blue Angel and Swedish TCO¹.

c) What are the costs and benefits and advantages and disadvantages of such substitutes?

Costs and benefits

Flame retarding polyamide or polyester with Exolit phosphinates will result in compounds which are (at current prices) comparable or only slightly more expensive than compounds with brominated flame retardants like PBDEs, brominated polystyrene or brominated benzacrylates. Phosphinates are more expensive on a per kg flame retardant basis, however, realistically the price per volume of flame retarded polymer compound should be compared. The necessary dosage of phosphinates is lower compared to brominated flame retardant systems which usually consist of the brominated flame retardant plus antimony trioxide as a synergist, i.e. phosphinates are more effective. In addition, the manufactured end products or parts are defined by their volume not mass, like e.g. a plug, connector or housing.

Are non-halogen flame retardants equivalent in terms of fire safety? Fire safety of products is defined by flammability tests which have to be met. If the test is passed, then the required level of fire safety is achieved. Only the minimum amount of flame retardants is added to safely pass the required flammability test. The required quantities differ vastly between the various kinds of flame retardants and can range from a few percent to more than 50 percent. The most efficient flame retardant in terms of quantity may not be the optimum solution, because it may be more expensive even in low amounts or it may have negative environmental or health properties. Non-halogenated flame retardants have the advantage that they do not produce toxic halogenated dioxins and furans as well as no corrosive smoke which might damage sensitive equipment and parts of a building. Furthermore, only halogenated flame retardants need antimony compounds as synergists.

Advantages

Compounds with Exolit phosphinates have:

- efficient flame retardant performance
- excellent electrical properties
- good mechanical properties
- low density

¹ There is only one exception, Exolit OP 1312, which contains < 5 % zinc borate and therefore has to be labelled with symbol N and risk phrases R50 / 53 "Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment"

- colourability
- high thermal stability

Disadvantages

- higher price on a per kg flame retardant base, but comparable price for flame retarded polymer on a volume base (due also to lower required dosage)
- phosphinates are not as universally applicable as Deca-BDE
- currently, production capacity limited to several thousand tons from a single supplier (Clariant)

Clariant Corporation at a Glance

Based at Muttenz near Basel, Switzerland, Clariant is a global leader in the field of fine and speciality chemicals. Some 27 000 employees in more than 100 group companies on five continents generate annual sales of over CHF 8.5 billion. Clariant is divided into five Divisions: Textile, Leather & Paper Chemicals, Pigments & Additives, Masterbatches, Functional Chemicals and Life Science & Electronic Chemicals.

Within the Division Pigments & Additives Clariant produces phosphorus based flame retardants, ranging from red phosphorus and ammonium polyphosphate to organic phosphorus products. Whereas the benefit of flame retardants in terms of their life-saving contribution to fire safety is undisputed amongst fire safety professionals, the demands on modern flame retardants have increased considerably in recent years: Apart from the need to be effective in the event of a fire, environmental protection is also becoming a key factor in all stages of the product life cycle - from production through processing and use right up to recycling. There is an increasing need and awareness to consider the effect of flame retardants on health and on the environment. This discussion is being initiated by the end users of the products and taken up by the processors. Clariant recognised these trends very early and developed flame retardants which meet these requirements. As a world-wide market leader for non-halogen flame retardants, Clariant provides active substances that not only offer optimum efficiency but are also economically viable and ecologically sound.

www.clariant.com
www.exolit.com

Attachments:

1. Exolit OP flyer
2. Exolit OP applications, paper by S. Hoerold for FR 2004 conference
3. Exolit OP presentation – (eco-)tox summary
4. Safety Data Sheets Exolit OP 1230, 1311, 1312