Almost all brominated organic flame retardants are used in combination with antimony trioxide as a true synergist. In combination with antimony trioxide, antimony halides are released in a step-wise manner, and these break down to form hydrogen halides which inhibit H• and •OH radicals as previously explained.

The processes for manufacturing brominated organic flame retardants vary from producer to producer. Many of these processes are known in the open literature through publications and patents. Brominations are carried out in a variety of organic solvents, and in some processes bromine itself is the solvent.

Great Lakes Chemical Corporation pioneered this unique process technology, which - as one would expect - is very cost effective. Most of the brominated organic flame retardants are high melting solids ground to fine particle size and very pure. There are some liquids, too, with a range of viscosities, boiling points and thermal stabilities.

There are many criteria considered in the selection of the best brominated organic flame retardant for a particular polymer system. The flame retardant may be simply an additive or a reactive component depending upon whether or not it becomes an integral part of the polymer system by chemical reaction. Key criteria considered in the selection process are : thermal stability, compatibility in the host polymer, dispersability, melting point, color, rheological properties, and light stability.

Brominated organic flame retardants are used in the complete range of plastic materials. Levels used vary from system to system. As little as 1 % by weight may be effective, but typically the level of flame retardant required to pass regulations ranges between 10 % and 25 % of the total finished compound by weight. When antimony trioxide is used as a synergist it is usually added at 25 % to 50 % of the weight of the bromine compound. Some particularly flammable compounds may require as much as 50 % by weight of flame retardants to be effective. Generally, the effectiveness of a brominated flame retardant is proportional to the percent bromine in the molecule.

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Dans sa conférence sur : "Bromine in organic flame-retardants : Synthesis, uses, economical importance and new developments".

Most brominated organic flame retardants are aromatic in character ; however, there are a few aliphatic species - especially cycloaliphatic. The principal classes of brominated organic flame retardants are the brominated bisphenol-A's, the brominated diphenyl ethers and the brominated phthalic anhydrides. These compounds will be covered in detail in the final document. More will be said of specific applications plus trends and predictions for new products and regulatory activities.

Meir Englert

Bromine in the world

Bromine production worlwide has not increased substantially during the past fifteen years. Despite this, the number of bromine-based products has grown ten-fold during this period. The bromine industry is closely related to many facets of the chemical industry.

What trends will the bromine industry take in the near future ? This paper will try to outline some of the possible directions in response to this important question. Some of the characteristics of the world bromine market today are summarised.

In conclusion, the two dominant forces which will determine the future of the bromine industry are the growing reliance of the chemical industry upon specialities and society's increasing concern for environmental protection. For the industry to remains prosperous, these forces must cooperate for expansion. New uses for bromine compounds must be found - uses which will solve ecological problems rather than create them.

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