eXPRESS Polymer Letters Vol.3, No.5 (2009) 267
Available online at www.expresspolymlett.com
DOI: 10.3144/expresspolymlett.2009.33

Editorial corner – a personal view

Chemically modified flame retardant polymers

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The increased attention to safety requirements has accelerated the investigation of flame retardant plastics, but the proportion of flame retarded types among commercial polymers is still lower than desirable. Nevertheless, certain segments of the industry started to recognize the importance of flame retardancy. According to a market study the annual consumption of flame retardants is currently over 1.8 million tonnes, which is the equivalent of a sales volume of approx. 3 billion €. The total flame retardant (FR) market will continue to increase with average annual growth rate of 3.7%, which is due in part to the fact that the use of plastics in the past few years has increased significantly. FRs are also of increasing importance due to the growing miniaturization of electronic and electrical equipment, which may imply high power density and areas with excessive heat. The heat concentration and fire threat associated with this miniaturization needs novel FR solutions.

There exist two main approaches to achieve flame retardancy: the additive and the reactive approach. Lately the reactive type was given much attention, especially in case of polycondensation or polyaddition type polymers, where monomers can be exchanged by components possessing both functionality and flame retardant moiety in the same molecule. The reactive FRs have numerous advantages: they provide more stable effect, as they are chemically incorporated into the polymer structure, so they do not migrate to the matrix surface either during high temperature processing or application. Due to these reasons less FR is needed to achieve same level of flame retardancy, which leads to reduction of toxic gas emission compared to the additive approach. Moreover, as they perform properly in low percentage, they do not influence considerably the properties of the matrix, which is a great advantage compared to the traditional FRs, such as metal-hydroxides. In addition, reactive FRs can be cost-effectively integrated in the production process, simply by replacing the original non-FR component; which is essential nowadays.

The sustainable development concept applied to this field implies that FRs should involve a low impact on health and environment during the entire life cycle including recycling and disposal. The increasing focus on these issues has drawn the attention to halogen-free additives, especially to phosphorous reactive FRs. Phosphorus can act both in gas phase, mainly at the beginning of degradation, and later on principally in solid phase as intumescent FR, providing an outstanding FR effect supported by this combined mechanism.

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