Editorial corner – a personal view

Fire retardancy of polymers: challenges and new concepts

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The rapidly growing polymer market increases the risk of fire. The competition for reducing the costs and the activities for increasing the recyclability are advantageous from many aspects but promote the use of cheap and flammable polymers.

The relative amount of the types of fire retardants (FRs) used in polymers is changing. The halogen containing compounds initiate corrosion, furthermore, some of them proved to be harmful to the environment and human health. Therefore the new European regulations promote the substitution of some conventional flame retardants by environmental-friendly ones.

Reactive processing methods bond the additives to the polymer chains thus provide solution against their release to the environment, which is critical especially for some potential pseudohormones. Beyond the increasing importance of reactive methods the nano-concept is the most widely investigated novel approach to fire retardancy. Promising is the low environmental impact of nanofillers and influence on the macromolecular arrangement owing to their high surface area (reducing the heat distortion and melt dripping at high temperature). However, their fire retardancy performance should be enhanced, which requires better understanding of the mechanism of their action. It has to be clarified what is the relative role of their catalytic and physical action. The importance of the geometric dimensions, quality of dispersion and the potential synergism between different types should be clarified as well. Furthermore, the undesirable by-effect

of removing stabilizers from the polymer matrix through their high surface area has to be eliminated. Most recent concepts are the in situ formation of nanofillers (during extrusion of the polymers) and of FR-active interfaces or surfaces around inclusions. Advancement of these concepts require the development of new micro-scale fire modeling/testing methods.

Based on the described research activities increasing use of reactive, halogen free solutions in combination with nanofillers of well designed interfaces are predicted. Economic approaches applying recycled polymer matrices, nanofillers and multifunctional additives will increase in the close future. A multifunctional flame retardant can be applied for example as adaptive interlayer in a multiphase systems facilitating good mechanical, transport or adhesive performance at ambient temperature and transforming to protective (heat and combustible-gas barrier) layer at the temperature of combustion.

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