High performance fire retardant polypropylene nanocomposites by electron induced reactive processing

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Abstract

Polypropylene (PP) belongs to one of the most used commodity polymers due to its exceptional properties including good chemical resistance, mechanical properties and processability at low price level. Thus, it is widely used in the automobile, transportation, engineering and building industry. Its main drawback is the high flammability. Several of halogenated flame retardants (FRs) are restricted by the European Community directives (ROHs, WEEE and REACH). Currently metallic hydroxides are widely used in industry, however the high loading (~ 60 wt.%) strongly influence the mechanical properties. A safe and environmentally friendly flame retardant alternative are intumescent flame retardants (IFR) which typical needs lower filler loading compared to metallic hydroxides. In this work, high efficient functional intumescent flame retardant and functional organoclay were used in order to prepare flame retardant PP by electron induced reactive processing. The functional surfactant of montmorillonite was designed to withstand melt mixing of PP and to be grafted to polypropylene by high energy electrons. The effects of the electron induced reactive processing (EIReP) on thermal stability, fire behavior and mechanical properties of fire retardant PP nanocomposites is discussed. The heat release, the production of toxic gases and the mass loss of EB modified fire retardant PP nanocomposites, are delayed in accordance to the result of cone calorimeter test. Based on these results high performance fire retardant polymer nanocomposites can be developed for industrial applications such as insulated material of wire, cable, etc.

Keywords: PP, MMT, melt mixing, electron induced reactive processing, flame retardant, nanocomposites

References:

1. C. Zschech et al., Journal of Plastics Technology 12 (2016) 112-134

2. D. Xiao et al., J. Therm. Anal. Calorim. 125 (2016) 321-329

3. D. Xiao et al., Applied Clay Science 143 (2017) 192-198