

Development of flame retardant nanocomposites based on nano-layered hybrid particles as real alternative to halogen based flame retardant additives

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A new concept of flame retardant nanostructured materials have been developed for thermoplastic applications. Nanotechnology allows the replacement of hazardous chemicals to produce sustainable flame retardant additives, based on nanolayered structures, using innovative green chemical routes.

Different nano-layered particles have been prepared and functionalised, by combining metallic nanohydroxides, hollow nanoparticles to encapsulate organic flame retardant and graphene nanoplatelets. The synergic effect against fire of different combinations of nanolayered particles, chemically bonded using an innovative self-assembly process (SAM), has been studied (figure 1 left).

These hybrid nanoparticles have been finally dispersed in thermoplastic and thermoset polymers. Figure 1 right shows the UL94 test result for a polypropylene with 2.5% of graphene and 12.5% of hollow nanoparticles with phosphate based flame retardant.

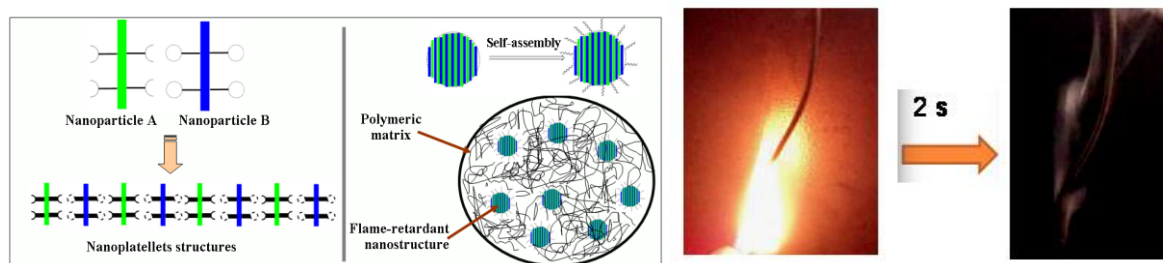


Figure 1. Nanoplatellet structure formation and functionalization by SAM technology (left) and UL94 test of PP modified with hybrid nanoparticles (right)

First results showed an improvement of the flame retardant properties of thermoset resins resulting in a V0 classification for the UL94 standard in prepreg samples. Mass loss calorimeter analysis confirmed a decrease in the heat release of ABS with modified lignin and LDPE with encapsulated phosphate flame retardants.

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