

HALOGEN FREE FLAME RETARDED PP COMPOUNDS DESIGNATED FOR CABLE PROTECTION CONDUITS

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Polypropylene (PP) is rising as an alternative polymer for the manufacture of conduits, replacing traditional PVC pipes. However, PP needs to be flame retarded in order to comply with the current stringent EU safety regulations regarding halogen content, smoke density and corrosiveness of released gases (EN50642, EN61034-2, EN60754-2). Herein, three flame retarded (FR) PP formulations (FR1-FR3) were developed by the incorporation of commercial FR additives into PP, by means of melt-compounding. A high impact strength heterophasic co-polymer (Repsol ISPLEN PB131N5E) was selected as reference PP. The additives used comprised: ammonium polyphosphate, a polymeric triazine derivative and a N-alkoxy hindered amine resulting in halogen-free formulations FR1 and FR2 which exhibited a condensed phase FR mechanism (intumescence) through forming a swollen protective char. A mixture of aluminum hypophosphite (AHP) and a phosphorous-bromine salt was also used for the low-halogen formulation FR3 (Br<1500 ppm), which exhibited a gas phase FR mechanism through releasing inert gases and bromine radicals. All compounds were characterized for flammability properties (UL94V), melt flow rate (MFR), thermal properties (DSC, TGA), mechanical and dielectric properties. The loading level for FR1 and FR2 in PP was 25 and 20 wt% respectively, while the attained UL94 class was V0 and V2. On the other hand, the loading level in FR3 was only 2 wt% and V2 flame retardancy was achieved, while intense melt-dripping removed the polymer from the flame zone. All three formulations complied with the EN50642 standard, and are very promising candidates for the manufacture of PP conduits.