

Role of nanoparticles as fire retardants for thermoplastic fibres

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ABSTRACT

All synthetic fibres are flammable and often burn with melting and/or flaming drips. Large amounts of flame retardants (>20% w/w) are usually needed to provide them required fire protection, but this more often causes processing problems during fibre production. During the last ten years or so, polymer layered silicates have been considered to be a new class of flame retardant systems, which when processed properly, can form nanocomposite structures within the polymer. The main advantages of polymer - nanocomposites are their lightweight, high modulus and strength, increased thermal stability and fire retardant properties, obtained by very low concentrations of nanoclay presence (<5% w/w). However, evidence over the last four years suggests that when present by themselves, they will not be able to fulfil all the required features of an ideal fire retardant such as conferring ignition resistance, self extinguishability and char-forming propensity. Recent work in our own laboratories suggests that they may increase the effectiveness of more normal fire retardants and thus enable lower quantities to be present, an especially important requirement in synthetic fibre production and processing. This paper reviews the recent work in our laboratories to demonstrate the effectiveness of functionalised nanoclays as fire retardants for thermoplastic fibre-forming polymers. Their interaction with conventional fire retardants is also explored. Prime examples will be polypropylene and polyamide.