# Effects of Fire Retardants on the Physical Properties of Polymers

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It is easy to forget that for the vast majority of polymer applications, resistance to fire is only a secondary or tertiary requirement. For example, poly(methyl methacrylate) is used in aircraft windows because of its transparency and impact resistance. Although fire resistance is also required, this is additional to the primary requirements. It is important, therefore, when developing a fire retardant strategy that the choice of fire retardant does not adversely affect the primary properties of the polymer. Clearly, in the case of aircraft windows, the use of opaque inorganic fillers would be inappropriate! On the other hand, liquid fire retardants may have plasticising effects, depressing the glass transition temperature of the polymer matrix. Fire retardants can also adversely affect processing, nanocomposites being one well-known example. Intrinsically fire resistant polymer such as Kevlar can also bring their own processing challenges that can limit their application.

The University of Strathclyde first became interested in the use of nanocomposites as fire retardants for polyurethane foams following an observation that highly filled polyurethane foam mattresses for use in prisons were too hard for comfort. Facing and overcoming the deleterious effects of the nanocomposites on processing, we soon found that using nanocomposites, although making for more comfortable foams, had unexpected consequences as a result of fairly subtle changes in the mechanical properties of the foams. Using this as one example, we shall examine the interaction between fire retardancy and the other useful properties of polymers.