EVA nanocomposites summary

Mechanical Properties

Since the eighties, polymeric nanocomposites have been intensely investigated due to the performance improvement achieved when a small amount of nanosized particles are added to a polymer matrix. The remarkable changes on physical and mechanical properties of polymers due to the addition of inorganic solid nanoparticles (typically in form of fibres, flakes, spheres or fine particles) is explained by the huge surface area, which increases the interaction between the nanoparticle and the polymer. Among to their particular properties including flame resistance , mechanical properties , gas barrier properties , thermal stability and biodegradability , when compared to pristine polymers. It is also used as fillers for glass fiber and carbon fiber. These improvements include enhanced physical and mechanical properties of high tensile moduli and strength, increased dimensional stability,decreased gas permeability and flamm- ability, improved solvent and UV resistance, improved electrical property and increased biodegradability of biodegradable polymers. Polymer/clay nanocomposites have been used in various consumer products and in the construction and transportation industry , with specific impact on technologies such as barrier layer materials, drink packaging applications, bottle applications, protective coatings, and adhesive molding compounds . Clay particles have been added to different polymers including multilayered PET, epoxy composites and polystyrene/polyethylene. With small amounts of a clay (usually less than 5 wt%) an enhancement of mechanical properties, permeability, thermal stability and flame retardancy, can be obtained as function of the length/diameter ratio (aspect ratio) and dispersion of the inorganic phase in the polymer matrix. Generally, EVA has been accepted for biomedical applications due to its random structures, which offer high ozone resistance, weather resistance, and exceptional mechanical properties. The melt compounded EVA copolymer by internal mixer (Brabender plasticoder) achieved the highest ambient and in vitro mechanical properties at low nanofiller content (1wt% organo-MMT). In contrast, the melt compounded EVA copolymer by twin screw extruder achieved the highest ambient and in vitro mechanical properties at high nanofiller content (5wt% organo-MMT). The melt compounded EVA copolymer by internal mixer (Brabender plasticoder) achieved the highest ambient and in vitro mechanical properties at low nanofiller content (1wt% organo-MMT). In contrast, the melt compounded EVA copolymer by twin screw extruder achieved the highest ambient and in vitro mechanical properties at high nanofiller content (5wt% organo-MMT). The mechanical properties, biostability and biocompatibility of the host polymer were significantly enhanced when low loading (1%) and well dispersed nanoclay filler was added into its structure. When higher loading of nanoclay (5%) was used, the degree of exfoliation and dispersion decreased which led to severe reduction on the mechanical properties and biostability of the EVA. However, the nanoparticles have a strong tendency to undergo agglomeration followed by insufficient dispersal in the polymer matrix, degrading the optical and mechanical properties of the nanocomposites

[1]–[8]

Fire retardancy