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Influence of keratin and DNA coating on flammability characteristics of PE/EVA blends

The combination of keratin fibers, obtained from feathers, with deoxyribose nucleic acid (DNA) is employed in low-density polyethylene-ethylene vinyl acetate (LDPE/EVA) blends using DNA coating with a segregated structure in order to enhance the blend flame retardant properties. The combined effect of each filler and the using of PEgMA as compatibilizer on PE/EVA flame retardant properties were analyzed. DNA by its chemical structure can be considered as an intumescent or blowing agent and when it is combined with keratin the char formation is promoted and the flame retardant properties are enhanced. Instead of melt compounding in the polymer bulk, DNA was distributed along specific layers forming a segregated network which resulted in better PE/EVA blend flame retardant properties. Limiting oxygen index (LOI), cone calorimeter determinations and flammability test (Underwriters Laboratory –UL-94) were used to evaluate the flame retardant properties. The composite morphology was determined by scanning electron microscopy (SEM). The mechanical properties were also evaluated by Dynamic-mechanical analysis (DMA). This filler combination significantly reduces the burning rate during horizontal flammability tests, increases the limit oxygen index and reduces the heat release rate during cone calorimetry tests. The flame retardant behavior was compared with a reference PE/EVA sample with 55 wt% of Magnesium Hydroxide currently used for wire coatings in the wire and cable industry. The results indicated that the combination of both types of fillers makes it possible to reduce the total Magnesium hydroxide filler content from 55 to 20% to achieve good flame retardant properties.

Biography

Saul Sanchez has his expertise in preparation and characterization of polymer nanomaterials. He is a senior researcher at Applied Chemistry Research Center (CIQA) for more than 29 years. He received his PhD in Materials Engineering from the UANL in Mexico. He has published more than 70 technical papers, 6 patents and 3 books related to polymer material science, and has supervised more than 20 MSc and PhD thesis. His research work at CIQA has been related most with: polymer processing, polymer nanocomposite materials, polymer functionalization, and characterization.

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