Electron beam irradiation of low density polyethylene/ethylene vinyl acetate filled with metal hydroxides for wire and cable applications

Abstract

The mechanical test showed that upon irradiation, the tensile strength (TS) values of the EVA/LDPE blends increased with the addition of EVA. A gradual increase in gel content (GC) and tensile strength (TS) with a concomitant decline in elongation at break (EB) and hot set (HS) were observed upon electron beam irradiation of the blends. The densities of all compounds were found to reduce with irradiation. The melt flow index test (MFI) results revealed that addition of ATH and MH reduced the flowability and addition of EVA improved the processability of the LDPE/EVA blend compounds. The TS of the LDPE/EVA blends deteriorated with the addition of flame retardants. The thermal stability and flame behavior of the halogen free flame retarded composites were studied by thermogravimetric analysis (TGA), limiting oxygen index (LOI), and cone calorimeter. The TGA results revealed that the decomposition temperatures of water evolved from the compounds incorporated with MH were significantly higher than that of ATH (i.e. 218–560 °C versus 310–610 °C). The minimum smoke density generation during the combustion obtained with 30% EVA content at both ATH and MH blends. The electrical test showed that the volume resistivity (VR) of the EVA/LDPE blends decreased with increase of EVA, ATH and MH contents, whereas, it declined with increasing irradiation dose. Consequently, this study demonstrated that addition of MH to the irradiated EVA/LDPE blends resulted higher thermal stability, better flammable retardancy, electrical and mechanical properties than addition ATH to the irradiated blends for wire and cable applications.