

Electron beam irradiation of low-density polyethylene filled with metal hydroxides for wire and cable applications

Abstract

The effects of electron beam irradiation for crosslinking of polymers used for wire and cable insulations are still being researched. In this research, the influence of electron beam irradiation on the different blends of low-density polyethylene (LDPE) filled with aluminum trihydrate and magnesium hydroxide (ATH, MH) were studied. It was revealed by melt flow index, tensile strength, and elongation at break tests that addition of MH to LDPE increases the adhesion forces inside polymer matrices more efficient than similar ATH/LDPE compounds. Field emission scanning electron microscopy test showed that MH is platy in structure and more homogenous mixed than ATH with LDPE. The results on thermogravimetric analysis and limiting oxygen index tests revealed that the thermal stability and incombustibility properties of MH blends are more efficient than similar ATH blends. Meanwhile, it was observed by smoke density test that MH blends produce the lowest smoke density compared with virgin LDPE and similar ATH blends. It was also observed that increasing irradiation by electron beam had impressive affections on the density, gel content, and mechanical properties for all the polymeric samples in this study.