Abstract

In this study, the improvement in mechanical properties and gas permeability of natural rubber/bromobutyl rubber (NR/BIIR) blends has been investigated when using platelike–structured particles as reinforcing fillers. These fillers include montmorillonite clay, kaolinite clay, bleaching clay and talcum. Surface modifications of fillers, as well as addition of Epoxidised Natural Rubber (ENR) as compatibilizer, were studied to further improve the properties of these rubber composites. Treatments of clays included cation–exchange reaction with octadecylamine for montmorillonite clay and silylation with silane–69 for kaolinite and bleaching clays. A thermagravimetric analyzer (TGA) was used to analyze the thermal characteristics of clay particles and %weight of the coupling agent incorporated onto clay surfaces after surface treatment. X-ray powder diffraction patterns of clay particles were obtained using an X-ray Diffractometer (XRD). The properties investigated here were tensile properties, surface hardness, compression set, abrasion resistance, and gas permeability. The results indicated that the untreated montmorillonite and kaolinite provided the highest abrasion and mechanical properties, respectively. On the other hand, untreated bleaching clay provided high modulus. After surface modification, the properties of treated montmorillonite and kaolinite composites were improved, whereas the properties of the treated bleaching clay dropped significantly. Moreover, the addition of 10 phr of ENR to the rubber composites has promoted faster cure, higher surface hardness and higher abrasion resistance to the composites of NR/BIIR blend. In term of gas permeability, talcum composite possessed twice as high gas barrier property as composites of other plate–like fillers, even with organophilic surface treatment. However, the disadvantages of talcum were low strength and abrasion resistance. The incorporation of ENR compatibilizer in the talcum composite could improve the abrasion resistance and mechanical properties significantly while maintaining good gas barrier property.