The effects of electron beam irradiation on the thermal properties, fatigue life and natural weathering of styrene butadiene rubber/recycled acrylonitrile–butadiene rubber blends

Abstract

The effects of electron beam (EB) irradiation on the thermal properties, fatigue life and natural weathering of styrene butadiene rubber/recycled acrylonitrile–butadiene rubber (SBR/NBRr) blends were investigated. The SBR/NBRr blends were prepared at 95/5, 85/15, 75/25, 65/35, or 50/50 blend ratios with and without the presence of a 3 part per hundred rubber (phr) of polyfunctional monomer, trimethylolpropane triacrylate (TMPTA). Results indicate that the crystallisation temperature (T_c) observed in polymeric blends is due to the alignment of polymer chains forming a semi-crystalline phase. Addition of TMPTA helps to align polymer chains through crosslinking. More crosslinking occurred between polymer blends with the help of TMPTA, upon irradiation. The improvement in fatigue life can also be associated with the stabilisation of SBR/NBRr blends upon irradiation and irradiation-induced crosslinking, which was accomplished with relatively low radiation-induced oxidative degradation in the presence of TMPTA. The tensile properties of both blends decreased over the periods of environmental exposure due to the effect of polymer degradation. After 6 months, the irradiated SBR/NBRr blends could not retain better retention [mainly with 25, 35 or 50 phr of recycled acrylonitrile–butadiene rubber (NBRr) particles] due to the samples becoming brittle over the long period of outdoor exposure.