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ABSTRACT

Space charge accumulation is a critical issue for the deterioration of the elevated temperature insulating property of polymeric materials. We present the influence of surface-modified ZnO nanoparticles on the space charge distribution and direct current (DC) resistivity of polypropylene (PP)/elastomer blends under elevated temperature. Octyltrimethoxysilane, a silane coupling agent, was used for the surface modification of nanoparticles. Morphology characterization results indicated that the elastomer and coated ZnO were well dispersed in the PP matrix. It was observed that the coated ZnO can significantly improve the insulating properties, including a minimized electric field distortion (4.0%) and increased DC volume resistivity (1.41×10^{18} Ω·m) under an electric field of 40kV/mm and 70°C. ~~For the same reason, t~~The DC resistivity of 2 phr PP/elastomer/ZnO ternary composites was improved by 13.4 times compared with that of pure PP/elastomer blends. The suppression of space charges may originate from deep traps existing in spherulite boundaries and interfacial zones between polypropylene and ZnO. This work provides an effective method to endow a recyclable insulating material with outstanding elevated temperature insulating performances.

KEYWORDS: Surface treatments; Nano composites; ~~Space charge~~ Electrical properties; High-temperature properties; Interface.

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