

Polymer-Ceramic Composite Film Fabrication and Characterization for Harsh Environment Applications

Authors : Santiranjan Shannigrahi, Mohit Sharma, Ivan Tan Chee Kiang, Yong Anna Marie

Abstract : Polymer-ceramics composites are gaining importance due to their high specific strength, corrosion resistance, and high mechanical properties, as well as low cost. As a result, polymer composites are suitable for various industrial applications, like automobiles, aerospace, and biomedical areas. The present work comprises the development of polymer-ceramic composite films and is tested for the harsh environment including weatherability and UV barrier property. The polymer composite films are kept in weather chamber for a fixed period of time followed by tested for their physical, mechanical and chemical properties. The composite films are fabricated using compounding followed by hot pressing. UV-visible spectroscopy results reveal that the pure polymer polyethylene (PE) films are transparent in the visible range and do not absorb UV. However, polymer ceramic composite films start absorbing UV completely even at very low filler loading amount of 5 wt.%. The changes in tensile properties of the various composite films before and after UV illuminations for 40 hrs at 60 deg°C are analyzed. The tensile strength of neat PE film has been observed 8% reduction, whereas the remarkable increase in tensile strength has been observed (18% improvement for 10 wt. % filled composites films). The UV exposure leads to strengthen the crosslinking among PE polymer chains in the filled composite films, which contributes towards the incremented tensile strength properties.

Keywords : polymer ceramic composite, processing, harsh environment, mechanical properties

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