

Nanoindentation Behavior and Physical Properties of Polyvinyl Chloride /Styrene Co-Maleic Anhydride Blend Reinforced by Nano-Bentonite

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Abstract : This article studies the effects of nano-bentonite on the structure and properties of polymer blends nanocomposites, based on polyvinyl chloride (PVC) and styrene co-maleic anhydride (SMA) blend. Modification of Egyptian bentonite (EB) is carried out using organo-modifier namely; octadecylamine (ODA). Octadecylamine bentonite (ODA-B) is characterized using FTIR, XRD and TEM. Nanocomposites of PVC/SMA/ODA-B are prepared by solution intercalation polymerization from 0.50 up to 5 phr. The nanocomposites are characterized by XRD and TEM. Thermal behavior of the nanocomposites is studied. The effect of different content of ODA-B on the nano-mechanical properties is investigated by a nano-indentation test method. Also the swelling and electrical properties of the nanocomposites are measured. The morphology of the nanocomposites shows that ODA-B achieved good dispersion in the PVC/SMA matrix. The thermal stability of the nanocomposites is enhanced due to the presence of the ODA-B. Incorporation of 0.5, 1, 3 and 5 phr. ODA-B into the PVC/SMA blends results in an improvement in nano-hardness of 16%, 76%, 92%, and 68% respectively. The elastic modulus increased by 37% from 4.59 GPa for unreinforced PVC/SMA blend to 6.30 GPa for 3 phr. The cross-link density and the electrical conductivity of the nanocomposites are increased with increasing the content of ODA-B.

Keywords : PVC, SMA, nanocomposites, nano-bentonite, nanoindentation, crosslink density

Conference Title : ICFMPCA 2015 : International Conference on Fracture Mechanics, Polymers, Composites and Adhesives

Conference Location : Paris, France

Conference Dates : May 18-19, 2015