

ABSTRACT

Sodium montmorillonite (Na-MMT) was made organophilic through the process of intercalation. X-ray diffraction study exhibits that the interlayer spacing increases with incorporation of alkyl ammonium ions and the extent of such increase is dependent on the chain length of alkyl ammonium ions.

Three different ethylene vinyl acetate (EVA) copolymers: rubber, thermoplastic elastomer and plastic have been processed to nanocomposite with organomodified montmorillonite by solution blending method. X-ray diffraction studies of these hybrids at an angle range $2\theta = 3^{\circ}$ to 10° confirms the formation of delaminated configuration. Transmission electron micrographs of EVA and 12Me-MMT hybrids indicate the formation nanostructure.

Evaluation of mechanical properties in terms of tensile strength (TS), elongation at break (EB), modulus at different elongations demonstrates that these nanocomposites have better mechanical properties compared to pristine EVA because of strong interaction between polymer chains and silicate layers. From dynamic mechanical analysis it is clear that the storage moduli of nanocomposites are more compared to pure EVA. Glass transition temperature (T_g) is shifted slightly to higher temperature on the introduction of clay and at the same time peak height of tangent loss ($\tan\delta$) decreases with filler concentration. This is attributed to the fact that the presence of nanometer level dispersed clay may restrict the motion of main chain and side group and pendant atoms.

It is quite notable from thermogravimetric analysis that the thermal stability is more compared to pure polymer in two nanocomposite systems as initial thermal decomposition temperature is shifted to higher temperature by few degrees and weight loss is decreased with filler loading. Barrier effect by

silicate layers and strong interaction between polymer chains and clay layers cause this improvement.

Swelling feature of these nanocomposites indicates that with the filler loading swelling index decreases and volume fraction increases. These are due to the presence of silicate layers, which restrict the penetration of small molecules of solvent and which in turn, monitor these two parameters.

X-ray diffraction studies of the phase $\text{CdIn}_2\text{S}_{4-x}\text{Se}_x$ confirm that all compositions with ($1.75 \leq x \leq 2.75$) crystallize with the ZnIn_2S_4 -IIIa type layer structure. X-ray line profile analysis of the 009 reflection of lithium intercalated $\text{CdIn}_2\text{S}_2\text{Se}_2$, i.e. $\text{Li}_{1.1}\text{CdIn}_2\text{S}_2\text{Se}_2$, shows that the crystallite size decreases due to the intercalation while the fractional change in interlayer spacing and the fraction of planes affected by defects increase. The temperature dependence of the conductivity for these compounds confirms that they are semiconducting. The variation of tunnel gap bias versus voltage spectra based on STM for all these compounds also shows typical semiconducting behaviour. The band gap energies deduced from DOS plots obtained by STM are nearly identical to that inferred from optical spectra.