Proc. of the Intl. Conf. on Nanotechnology for Better Living, 2016
Editors K. K. Kar, A. Shah and R. Sharma
Vol. 3, No. 1, p. 64
doi:10.3850/978-981-09-7519-7nbl16-rps-64

NBL-2016

Analysis of various properties of polyvinyl alcohol-graphene oxide nanocomposite films

Nitish Raja*, Dhiraj Kumar Rana and Soumen Basu#

Department of Physics, National Institute of Technology, Durgapur-713209, India
Email: *nitish.raja90@gmail.com, #sou_menbasu@yahoo.com

The pure phase Graphene oxide (GO) was prepared by hummers method and was confirmed by XRD analysis. In XRD pattern a sharp peak appeared at angle 2θ = 11.01° (Figure 1a) PVA-GO nanocomposite with varying GO wt% (0, 2 and 8 wt%) was synthesized by drop casting method and characterized by help of various characterization techniques. Surface morphology of composite films is studied by SEM analysis (Figure 1b-1d). Thermal behavior of PVA-GO nanocomposites with different weight % is analyzed by DTA-TGA curve (Figure 2).

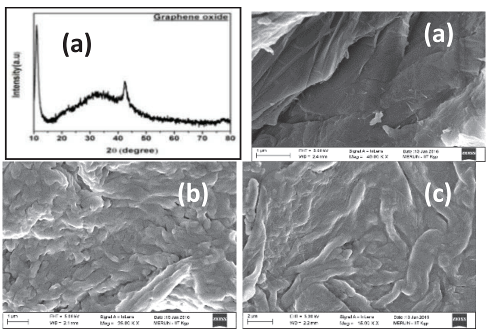

Figure 1: (a) XRD pattern of pure Graphene oxide. (b-d) SEM images of (b) PVA, (c) PVA-GO (2wt %) and (d) PVA-GO (8wt %)

From DTA analysis it is observed that the peak obtained at around 230 °C for PVA and PVA-GO nanocomposites represents the onset of degradation and it also confirmed from TGA analysis. TGA analysis showed the huge weight loss nearly 82% obtained for PVA, PVA-GO nanocomposites and for pure GO the weight loss is nearly 62% in temperature range 230-370°C. The thermal stability of GO increased with increasing GO weight % in PVA-GO nanocomposites. The temperature dependent electrical properties such as resistivity (ρ), dielectric constant (ε), tangent loss (tan δ) of PVA-GO nanocomposites are investigated at temperature range 30< t <150 °C (Figure 3). The temperature dependent dielectric constant plot showed that ε increased from 18.9 to 34.5 with increasing GO wt % in PVA, PVA-GO (2wt%) respectively. At room temperature the dielectric constant is increased from 18.9 to 34.5 and resistivity decreased from 22.01 to 9.5 Ωm with increasing GO wt% in PVA-GO composites. Arrhenius relation (eq. 1) is used for determining the activation energy of the samples.The tangent loss (δ) obtained for PVA, PVA-GO nanocomposite is approximately 0.2.

$$\rho(T) = \rho(0)exp[\frac{E_a}{K_\beta T}] \qquad (1)$$

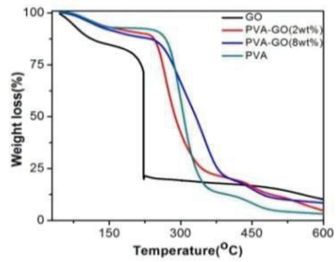

Figure 2: Temperature dependent weight loss of PVA-GO nanocomposite

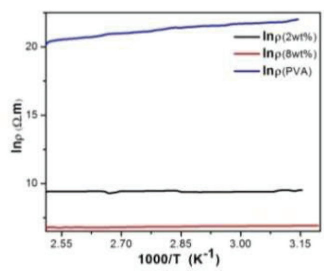

Figure 3: Temperature dependent resistivity of PVA-GO nanocomposite

References

1. Zhu et.al, “Graphene and Graphene Oxide: Synthesis, Properties, and Applications”, *Advanced materials* XX, (2010) 1-19.
2. Park et.al, “Preparation of novel CdS-graphene/TiO_2 composites with high photocatalytic activity for methylene blue dye under visible light", *Bulletin of Materials Science*, 36, no. 5 (2013) 869–876.