The Effect of Silver Particles on the Synthesis and Characterization of Polystyrene/Silver (Ps/Ag) Nanocomposites for Carbonaceous Materials

Jibrin Alhaji Yabagi, Mohammed Isah Kimpa, Bello Ladan Muhammad, Maytham Qabel Hamzah3,,, H. K. Abdul Kadir and Mohd Arif Agam

ABSTRACT

Polymer nanocomposites containing inorganic fillers like metallic particles dispersed in polymer matrices are of great interest for optical, electronics and dielectric applications. Polymer/inorganic such as polystyrene/silver nanocomposite (PS/Ag) can be manipulated through various treatments in fabricating desired material such as optical, sensors and microwave absorbance. PS/Ag nanocomposite was successfully synthesized using ex-situ mix solution technique. The composite was further investigated using Field Emission Scanning Electron Microscope and Energy Dispersive Spectroscopy (FESEM/EDS), Atomic Force Microscope (AFM), X-ray Powder Diffraction pattern (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), Raman Spectroscopy and Ultraviolent-visible Spectroscopy (UV-vis). The effect of Ag particles was studied using FESEM by showing the homogenous spherical shape of the PS particle since the presence of Ag particles alters the surface morphology of the PS/Ag nanocomposites. The topographical analysis by AFM indicates a uniform surface distribution of Ag particles on the PS matrix, the root mean square and surface roughness of the PS and PS/Ag nanocomposites were found to vary with the variation of Ag particles in the composites. Furthermore, the structural pattern of the composites investigated using XRD indicates the presence of PS at $2\theta = 19.7^0$ shown by the amorphous nature of the polymers. PS/Ag nanocomposites show more peaks and pure crystalline structure of the composites. The carbonaceous structure of PS and PS/Ag nanocomposites were investigated using Raman spectroscopy which indicates the presence of the large number of carbon atoms linked together. Raman further revealed the peak at 1367 cm−1 and ~1594 cm−1 assigned to D-band (less ordered carbon structure) and G-band (highly oriented graphite-like structure and diamond-like carbon) within the composites.