Effect of Ionizing Radiation on Synthetic Metal Polymer Composite

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Abstract

The physical and chemical structural changes occurred due to the electron beam irradiation of PVA/V_2O_5 and PVA/PVP/V_2O_5 composites were investigated. A series of poly (vinyl alcohol)/poly (vinyl pyrrolidone)/vanadium pentaoxide xerogel composites were prepared in different ratios and exposed to different electron beam irradiation doses. Changes in the physico-chemical properties of composites with increasing irradiation dose were investigated using Fourier transformer infrared spectroscopy (FTIR), UV/VIS spectrophotometer, X-ray diffraction (XRD), and thermal gravimetric analysis (TGA). The analysis using FTIR, UV/VIS, X-ray, XRD, FTIR spectroscopy reveal that the characteristic stretching frequencies for the prepared PVA/V_2O_5 and PVA/PVP/V_2O_5 composites are shifted towards lower frequencies side, as compared to PVA and PVA/PVP composites. Also, the FTIR investigation suggests that the inorganic and organic components strongly interact during processing and irradiation manifested that (PVA/PVP) blends were misible blends. XRD data illustrate that PVA/V_2O_5 and PVA/PVP/V_2O_5 have many aggregated pores which have been reduced due to the homogenous distribution of V_2O_5 in polymer matrix. Also, the diffraction

patterns of PVA/V_2O_5 and PVA/PVP/V_2O_5 composites show broad and lower peaks as compared with PVA and PVA/PVP matrixes suggesting a decrease in the crystallinity of V_2O_5 loaded matrices. Therefore, XRD indicates that the polymer matrix PVA and /or PVA/PVP are intercalated within the interlayer region of the V_2O_5. UV/VIS investigation indicated that either irradiation or loading the polymer matrix with various content of V_2O_5 affect the absorption bands and optical properties of the hybrid composite compared with pure PVA and PVA/PVP composite. TGA study indicates that the thermal stability of PVA/V_2O_5 and PVA/PVP/V_2O_5 composites was enhanced as compared with unhybridized ones as a result of either irradiation or V_2O_5 loading. The crystalinity degree of the matrix changed due to the blending, xerogel addition and/or irradiation process.

AIM OF THE WORK

The present work aims at:

Understanding the change in structure, degree of crystalinity the composites occurred due to the exposure to Electron beam, blending, and addition of vanadium pentaoxide xerogel to the polymer blends of poly (vinyl alcohol)/poly (vinyl pyrrolidone). The association of polymer matrix with inorganic component may exhibit synergic behavior leading to added functionalities to parent materials and consequent potential applications in varies fields.

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