Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Electronic Supplementary Information

Effect of molecular level dispersion of Graphene Oxide on free volume characteristics of Poly (vinyl alcohol) and its impact on thermal and mechanical properties of their nanocomposites

S. K. Sharma[†], J. Prakash[‡], P. K. Pujari[*,†]

[†]Radiochemistry Division, [‡]Powder Metallurgy Division, Bhabha Atomic Research Centre, Trombay Mumbai 400085, India

1. The figures S1-S2 shows the SEM Micrograph of GO spread over Ta sheet and the EDX spectrum of the same. The presence of oxygen establishes the presence of hydroxyl, epoxy and carbonyl functionalities on GO surface.

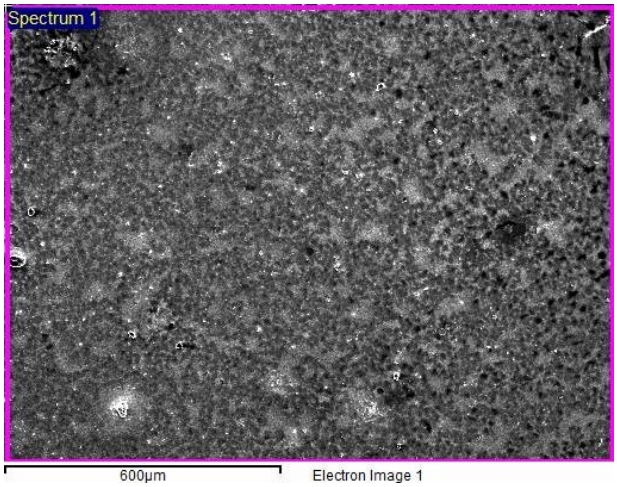

Figure S1. *SEM micrograph of GO spread over Ta sheet*

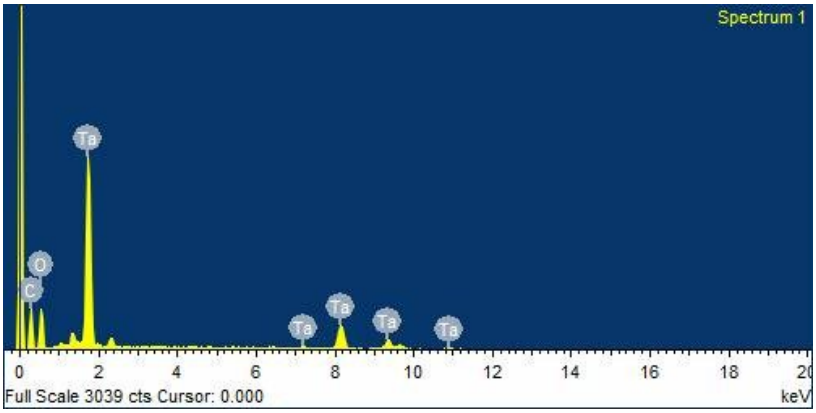

Figure S2. *SEM-EDX spectrum of GO spread over Ta sheet*

2. The figure S3 shows the DSC thermogram for the heating cycle of pure PVA and the nanocomposite films. It is observed that melting point of PVA crystallites remains unaffected on GO incorporation in PVA matrix.

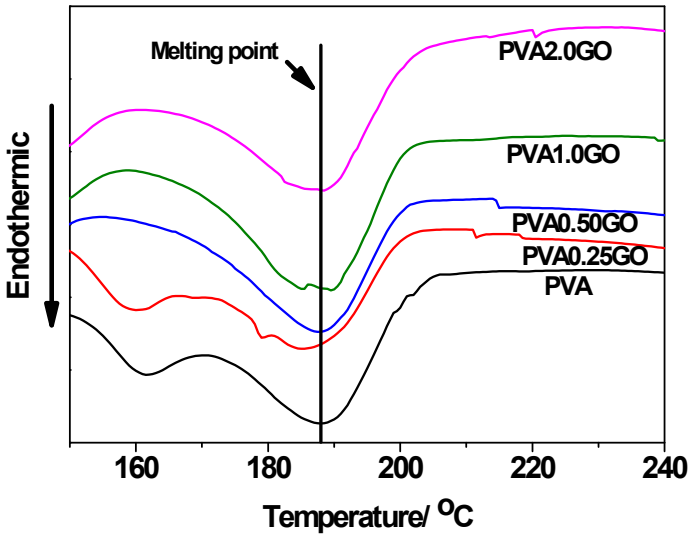

Figure S3. *Heating cycle of DSC measurements showing the melting of PVA crystallites*

3. In order to elucidate the nature of interaction between PVA and GO using PALS data, the difference in positron intensity (I_2) of nanocomposite with pure polymer as a function of GO loading, which is related to interfacial interaction, is plotted in figure S2.[20] In case of no interfacial interaction between PVA and GO, the linear variation of I_2 based on the volume fraction (Φ_v, calculated using weight fraction and density of PVA and GO) is also calculated using equation S1

$$I_2^c = \phi_v I_2^P + (1-\phi_v) I_2^{GO} \qquad \text{(S1)}$$

where *c*, *GO* and *p* represent composite, GO and PVA, respectively. The experimental results show positive deviation from the calculated intensity indicating the strong interaction between PVA and GO in the nanocomposites.

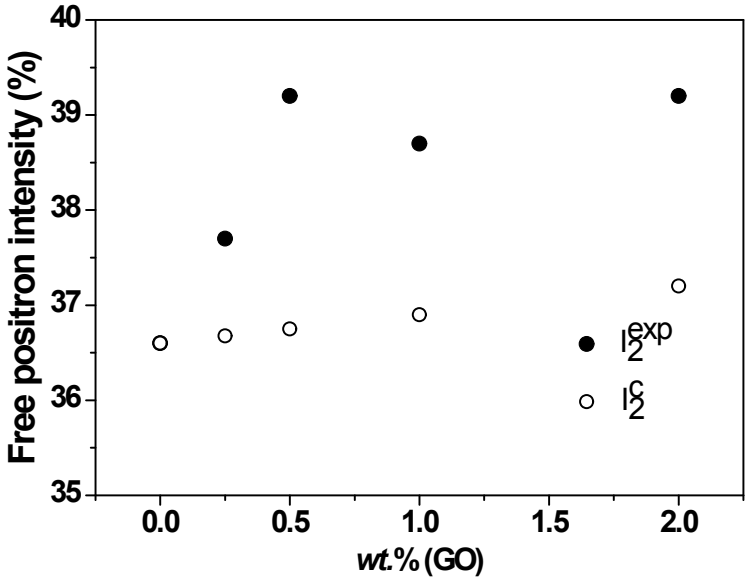

Figure S4: *Plot of experimental free positron intensity as a function of GO loading. The variation in calculated free positron intensity according to simple admixture rule is also shown.*