Electronic Supplementary Material (ESI) for RSC Advances


# Supplementary Material

## Interrelated Shape Memory and Payne Effect in Polyurethane/Graphene Oxide Nanocomposites

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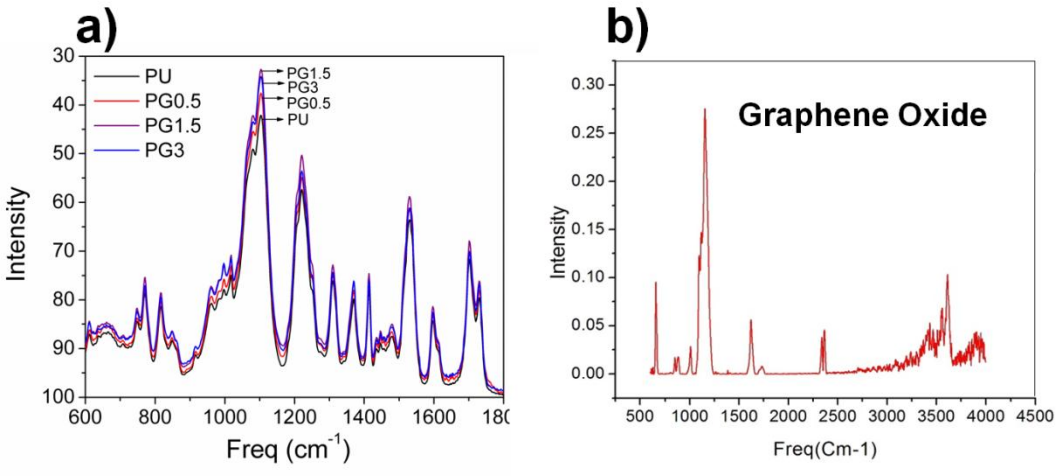
S1. FTIR Specrum of GO and PU/GO nanocomposites

S2. TGA of PU/GO composites

S3. DSC of PU/GO nanocomposites

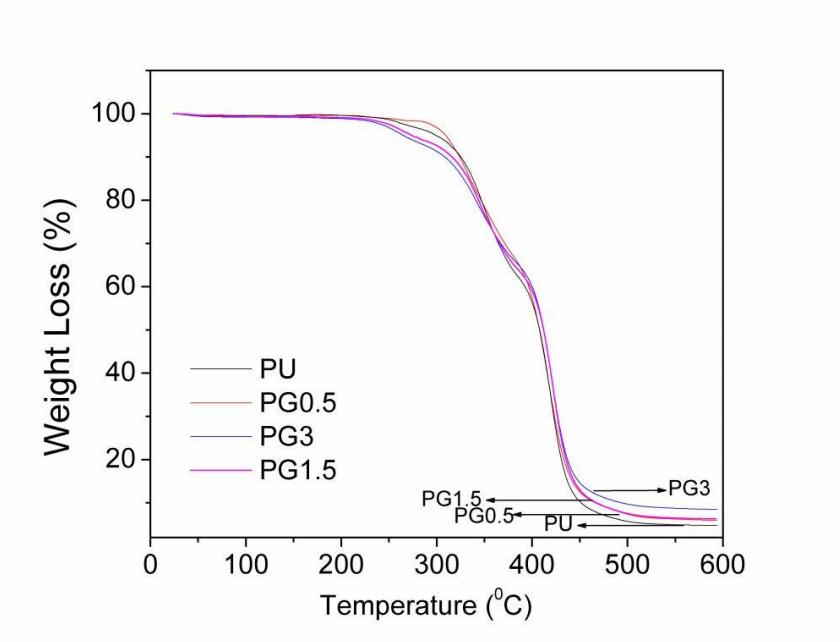
S1. **FTIR Specrum of GO and PU/GO nanocomposites**




FTIR spectra of GO and the nanocomposites were recorded in FTIR Nicolet, Impact 410 spectrophotometer by making KBr pellets with the sample. In the case of GO, the FTIR peak at 1719 $cm^{-1}$, attributes to the vibration of bonds within the benzene ring and carboxyl groups, also one peak at 1223 $cm^{-1}$resulting from the presence of C—O group and three peaks at 826, 934 and 1027 $cm^{-1}$which are caused by vibrations of the epoxide group. All these indicate the presence of ionic groups on GOs.

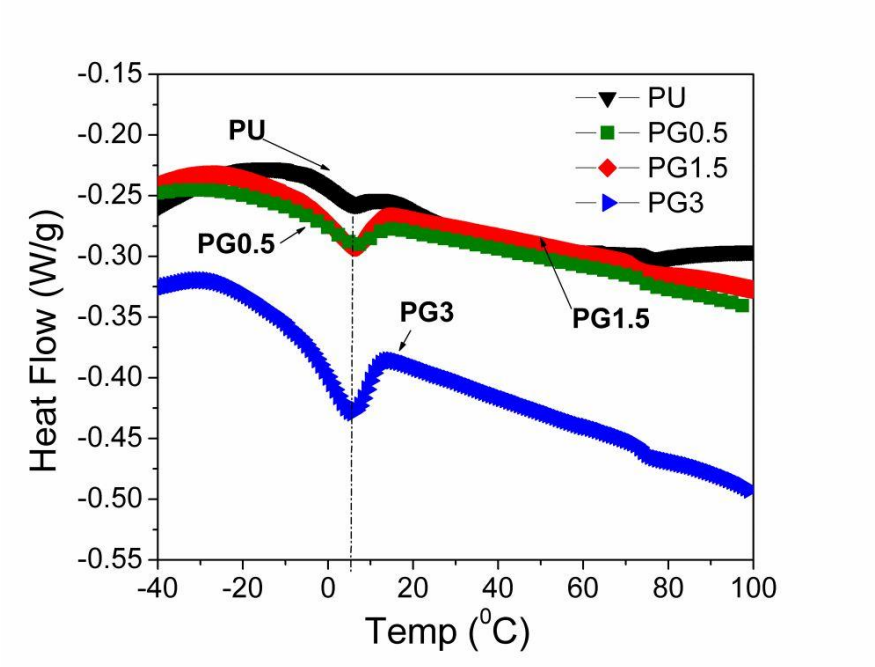
In composites, some of the bands of GOs are found to be diminished due to the possibility of chemical bonding between the individual groups of PU and GOs. The characteristic absorptions peaks of the PU are observed at 3306 $cm^{-1}$ (N–H stretching frequency), 2925–2852 $cm^{-1}$ (–CH**2**– and –CH**3** stretching frequencies), 1731 $cm^{-1}$ (carbonyl urethane stretching), 1526 $cm^{-1}$ (CHN vibration), 1223 $cm^{-1}$ (coupled C–N and C–O stretching), and 1079 $cm^{-1}$ (C–O stretching). Comparison of neat PU with the nanocomposite indicates that all the characteristic absorptions of PU remain unchanged in the PU/GO nanocomposite.

**S2. TGA of PU/GO composites**




TGA reveals the two stages of thermal degradation occurring in the polymer and the composites. In PU, the two stages can be explained as: the first stage by the degradation of the hard segment and the second stage by the degradation of the soft segment. GOs enhance the thermal stability of polymer by acting as a mass transport barrier to the volatile products generated during decomposition. The derivative of the weight loss curves can give more distinct degradation temperature peaks, where the effect of GO sheets can be clearly seen.

**S3. DSC of PU/GO nanocomposites**




The DSC is used to get information about the glass transition temperature (Tg), of the composites. The sharp endothermic peak of PUs at about 5°C corresponds to the glass transition peak of the polymer. In the nanocomposites, there is an observable variation in the peak area, even though much change in the glass transition temperature is not observed. This corresponds to the confinement effect of GO sheets on the PU elastomer.