Supplementary Information

Superior nano-mechanical properties of reduced graphene oxide reinforced polyurethane composites

Tejendra K. Gupta[1], Bhanu P. Singh[1*], Ravi Kant Tripathi[3], Sanjay R. Dhakate[1], Vidya N. Singh[2], O.S. Panwar[3] and Rakesh B. Mathur[1]

[1]Physics and Engineering of Carbon, Division of Materials Physics and Engineering, CSIR-National Physical Laboratory, New Delhi-110012, India

[2]Electron and Ion Microscopy Section, CSIR-National Physical Laboratory, New Delhi-110012, India

[3]Polymorphic Carbon Thin Films Group, Physics of Energy Harvesting, CSIR-National Physical Laboratory, New Delhi-110012, India

XRD Studies of graphite, GO and RGO

XRD is important for both structural and compositional studies. The intensity of the peak centered at 2θ value of 26^0 corresponding to the (002) planes (figure S 1) confirms the presence of graphitic structure in the material and it is the central deciding parameter in defining the structure of a graphitic material by XRD technique.

Oxidation of graphite causes the peak at 26^0 to shift near 10^0. In GO, the previously contiguous aromatic lattice of graphene is interrupted by epoxides, alcohols, ketone, carbonyl and this disruption of the lattice is reflected in an increase in interlayer spacing from 0.336 nm (Graphite) to more than 0.625 nm (GO).Which causes shifting of peak to 10^0 shown in figure S 2. The layers exfoliate and the spacing between them increases resulting in a significant broadening of this peak which is evident in the XRD pattern of GO.
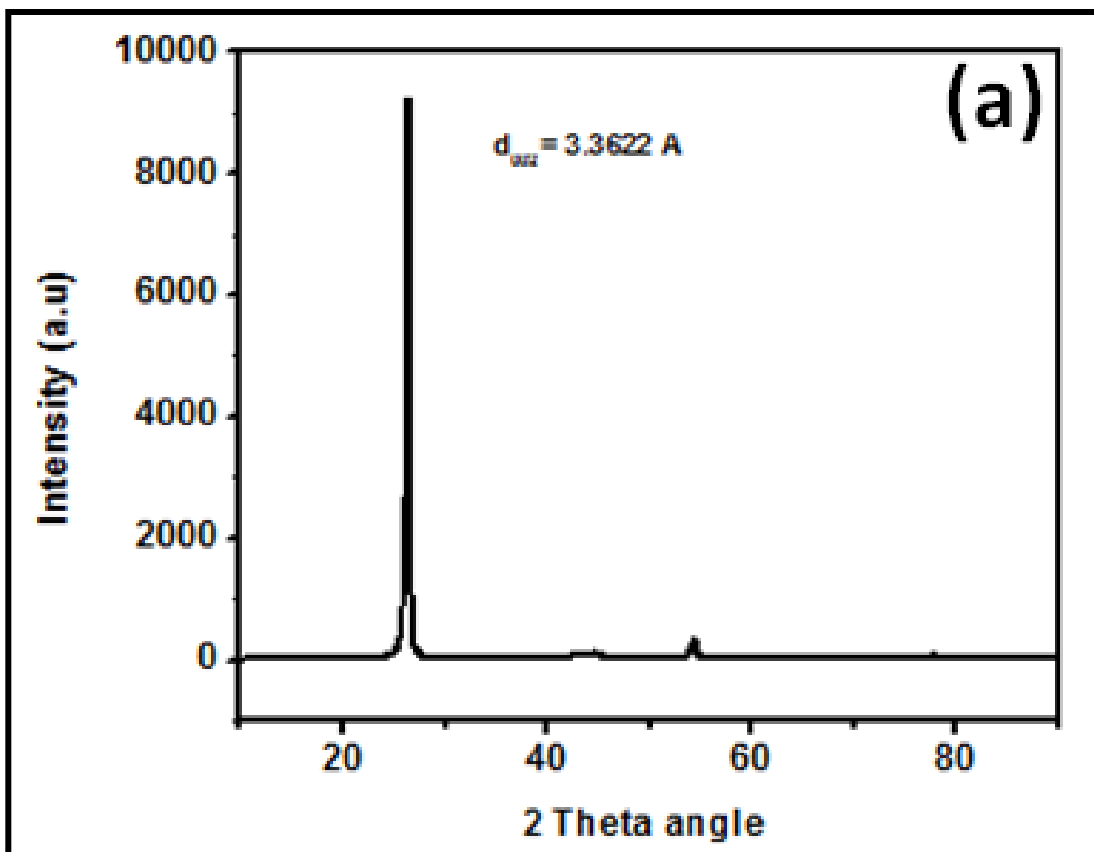
Figure S 1: XRD pattern of natural graphite

In figure S 2, XRD patterns of RGO which is reduced at 1050 ^{0}C can be seen as broad low intensity hump at 26^0 thus confirming the formation of few layer graphene sheets; this is because of disappearance of functional groups and a weak bonding between graphene layers after reduction. After reduction, all the bonds between graphene layers break down and no definite interlayer spacing is therefore present.
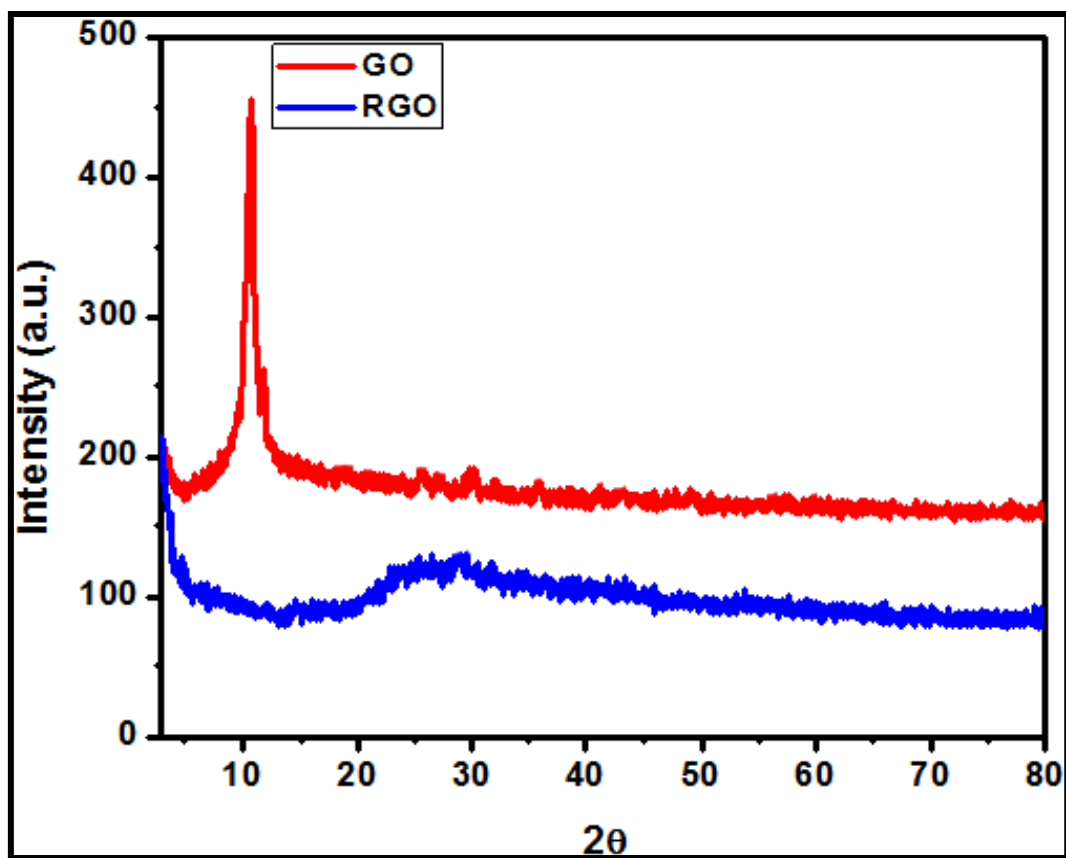
Figure S 2: XRD pattern of GO and RGO