

Figure S1. Schematic illustration of the structure of graphene nanoscrolls indicating the smaller diameter (d_1) and larger diameter (d_2).

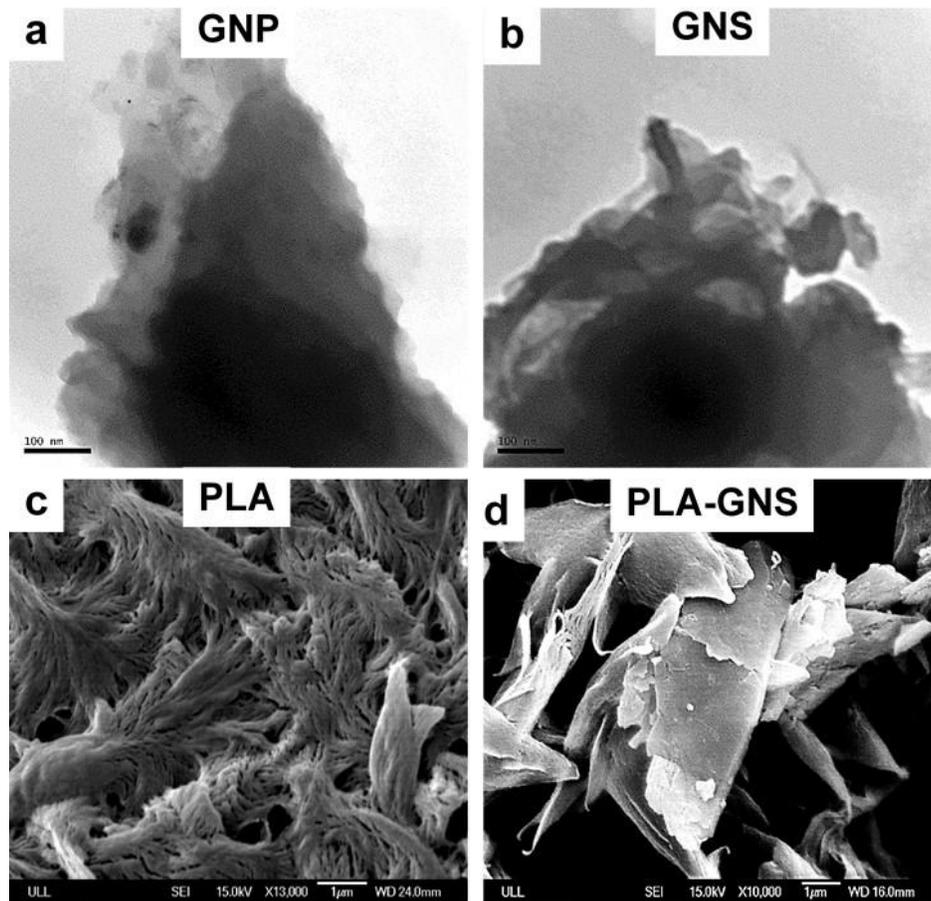


Figure S2. Transmission electron micrographs of (a) graphene nanoplatelets (GNP), (b) graphene nanoscrolls (GNS) and scanning electron micrographs of (c) pure PLA and (d) PLA crystallized on GNS.

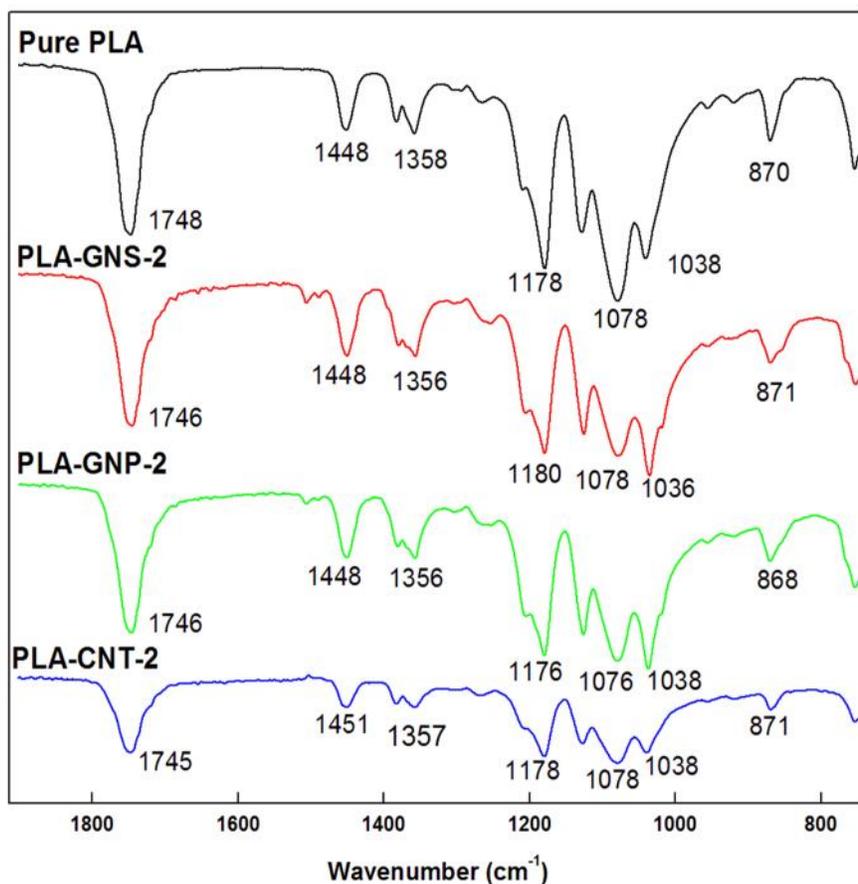


Figure S3. FTIR spectra of pure PLA and its various nanohybrids with carbon nanoparticles.

FTIR spectra of the PLA nanohybrids is given in Figure S3. In pure PLA, the absorption bands at 1086-1185 cm^{-1} and 1756 cm^{-1} are due to the stretching vibration for C=O and -C-O- groups. Further, the peaks at 1355 -1455 are due to the stretching and bending vibrations of -C-H groups of PLA. Shifting of these peaks is indicative of interactions between the PLA chains and the nanoparticles. For instance, the peaks (1756 cm^{-1} and 1448 cm^{-1}) in pure PLA has been shifted to 1745 cm^{-1} and 1451 cm^{-1} in PLA-CNT. This is due to the tubular structure of CNT facilitating interactions with PLA chains. However, relatively planar architecture of GNP and GNS did not provide a surface for epitaxial growth of PLA chains.

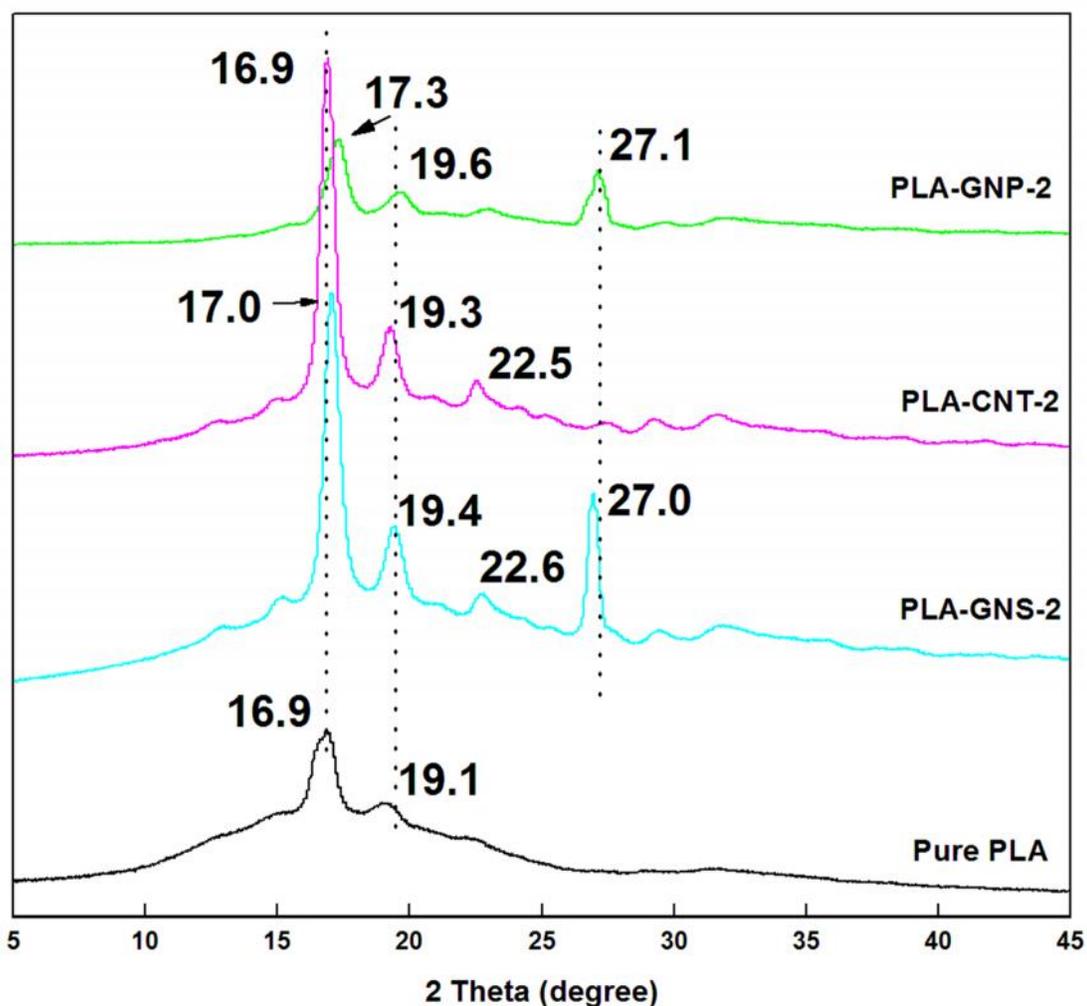


Figure S4. X-ray diffraction (XRD) patterns of pure PLA and its various nanohybrids with carbon nanoparticles.

Fig S4 shows the X-ray diffraction (XRD) patterns for pure PLA and its nanocomposites. The prominent peak in pure PLA at 16.9° is due to reflections from the (200) and/or (110) planes and the less intense peak at 19.1° is due to reflections of the (203) plane. These peaks are related to the stable β -crystals of PLA. In PLA nanohybrids, the stable β -crystals of PLA appear at $\sim 22.5^\circ$ indicative of the (010) and (015) reflections. Slight shifting of the peaks in pure PLA is indicative of interactions between PLA and nanoparticles. The diffraction peak at $\sim 27^\circ$ is a typical characteristic of the multilayered sheet structure of graphene in the PLA matrix.