Electronic, electrical and magnetic properties of graphene oxide /Fe_2O_3 nanocomposites

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Abstract

Graphene which represent a one-atom-thick two-dimensional graphitic carbon system has been found useful in several applications and devices due to its high mobility, mechanical and optical transmittance properties. Here, the electrical and magnetic properties of graphene oxide used as graphene substitute is tuned using iron oxide nanoparticles with 2-aminoterephthalic acid (ATA) as capping agent. Reduced graphene oxide/ Fe_2O_3 nanoparticles was synthesized using the Co-precipitation method where the electrical and magnetic properties were studied. The obtained result showed a reduction in the I_D/I_G of graphene oxide $(0.46 \rightarrow 0.43)$ when reduced by NH_4OH and functionalized with Fe_2O_3 nanoparticles. An enhancement of the electrical and magnetic properties of GO are also enhanced when functionalized with Fe_2O_3 nanoparticles. The enhancements maybe due to the reduction of sp^2 C=C with enhancement of sp^3 C-C clusters in GO. The results are consistent with observations of the electronic properties of GO and GO/Fe_2O_3 nanoparticles from X ray photoelectron spectroscopy and X ray absorption near edge spectroscopy measurements. The enhancement of the electrical and magnetic properties of rGO-ATA-Fe_2O_3 is mainly attributed to the presence of Fe 2p atoms. The implication of the results gives an indication of its applicability in ferroelectric and memory devices.