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Effect of Surface Potential and Charge Transfer Mechanism in Reduced Graphene Oxide and Magnetic Nanocomposites

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Graphical abstract

In this paper, the charge transfer mechanism in hydrothermally synthesized cobalt oxide/reduced graphene oxide (Co_3O_4/RGO) nanocomposites has been established. Scanning and transmission electron microscopy results expose the decoration of Co_3O_4 nanoparticles on GO sheets. Magnetic response of nanocomposites was confirmed from superconducting quantum interference device magnetometer measurement. Raman spectroscopy investigated optical properties of these nanocomposites. The Raman spectra of Co_3O_4/RGO nanocomposites shows the enhancement of D and G bands which are associated with GO due to the Surface-enhanced Raman spectroscopy effect and blue shift. Increase in the full-width half-maximum value as well as upshift in D and G peaks are strong signals of association of charge transfer process between GO sheets and decorated Co_3O_4 nanoparticles. The effect of charge transfer process is measured in the expression of shifting of Fermi energy level of Co_3O_4/RGO nanocomposites. Charge transfer is correlated with observed Raman shift and scanning Kelvin probe microscopy. XRD spectra of Co_3O_4/RGO confirm the polycrystalline nature of Co_3O_4 nanoparticles.