

# SMART GRAPHENE OXIDE BASED COMPOSITE MATERIALS AND THEIR ELECTRIC AND MAGNETIC STIMULI-RESPONSE

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Graphene oxide (GO), a single-layered exfoliated graphite oxide from graphite fabricated through mechanical or chemical methods, has attracted significant interest as one of the most interesting functional materials with lower electrical conductivity, relatively high polarizability, low cost and scalable production, while maintaining the characteristics of graphene in both academia and industries. The presence of the functional groups provides GO sheets amphiphilic with lower electrical conductivity which is appropriate for its electrorheological (ER) application. In addition, its good hydrophilic properties due to the presence of oxygen-functional hydrophilic groups, such as hydroxyl, carbonyl and carboxyl groups not only makes GO readily dispersible in water to form stable colloidal suspension, but also facilitates the preparation of GO-based composites in solution. Therefore, graphene/GO-supported materials have attracted significant interest for fascinating both ER and magnetorheological (MR) effects. As for ER systems, we have studied various GO-based polymer composites with polyaniline, copolyaniline and poly(p-phenylenediamine), along with core-shell structured polymer-GO microspherical particles with poly(methyl methacrylate), poly(glycidyl methacrylate) and polystyrene (PS). Nanocomposites of GO with various inorganic particles such as titania, silica and alumina are also attempted. All these GO composites exhibit improved ER characteristics compared to that of pure GO. The GO was also either added as an additive into magnetic carbonyl iron (CI) particles or coated on the CI surface to improve the dispersibility and settlement problem of CI particle based MR fluids. The GO as a solid surfactant introduced into the GO/PS Pickering emulsion polymerized ER material will be also covered.