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Noncovalent approach for the solubilization of chemically Reduced Graphene Oxide (RGO) and Carbon Fiber Oxide (CFO)

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Either covalent or noncovalent functionalization methods have been utilized to provide enough solubility for RGO after functionalization. In covalent approach, covalent introduction of charges, small molecules, or polymers has been reported to be successful for the interruption of strong Van der Waals interactions between RGO plates and subsequent enhancement of dispersion stability of functionalized RGO. But every singly covalent attachment leaves single sp^3 carbon on RGO plates, resulting in detrimental effects on the property of RGO. Especially, electrical and thermal conductivity of RGO strongly correlates with its sp^3 defect density.

Noncovalent approach can overcome this limitation of covalent approach because noncovalent interaction does not require any covalent linkages between RGO plates and interacting molecules. π-π interaction is the most frequently attempted noncovalent interactions to produce soluble or dispersible RGO by using p-rich small molecules or polymers. This noncovalent anchoring of molecules on RGO plates can be visualized by monitoring fluorescence quenching of interacting molecules after noncovalent anchoring on RGO plates. Recently, various aliphatic polymers have been known to enable the solubilization of RGO through noncovalent interaction. PNIPAM, PAM, PVP, PAA, cellulose derivatives such as lignine and HPC, biomolecules such as heparin, or dendrimers such as polypropyleneimine dendrimer have been effective for the solubilization of RGO even though the absence of π-rich moiety.

In this report, we demonstrate how to visualize noncovalent interaction between polymer chains and RGO plates to confirm which noncovalent interaction dominates prevails in specific RGO/polymer assembly system. And, we suggest alternative protocol for the formulation of graphene-like nanofillers such as carbon fiber oxide.

Biography

Insik In has completed his Ph.D at the age of 30 years from Korea Advanced Institute of Science and Technology in South Korea and postdoctoral studies from University of Wisconsin-Madison. He is the co-director of the Polymer Society of Korea. He has published more than 30 papers in reputed journals in the field of polymers, nanomaterials, smart materials.

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