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Poly (allylamine hydrochloride) - reduced Graphene Oxide (rGO/PAH) nanocarriers for potential application in non-viral gene therapy

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Cationic polymers for gene delivery to cells both *in-vitro* and *in-vivo* have been studied in detail. However, studies have shown that cationic polymer such as polyethyleneimine (PEI) suffer from high cellular toxicity and poor biocompatibility. Graphene and its derivatives such as Graphene Oxide (GO) and reduced Graphene Oxide (rGO) have emerged as excellent nanomaterials for biomedical applications such as drug delivery, gene delivery, cellular imaging, biosensing, photothermal therapy, photodynamic therapy, tissue engineering etc due to their excellent physicochemical, optical and biocompatible properties. Here, we report the synthesis of a novel non-viral nano-vector for efficient gene delivery by functionalizing rGO sheets with a water-soluble biocompatible cationic polymer Poly (allylamine hydrochloride). GO sheets synthesised by improved Hummer's method were simultaneously reduced and functionalized by PAH to form physiologically stable rGO/PAH nanocomposites. The optical, morphological, chemical, and structural properties of these nanocomposites were characterized in detail using UV-Visible spectroscopy, Raman spectroscopy, TEM, SEM, AFM, FT-IR and XRD respectively. Gel retardation assay using pEGFP clearly demonstrated the efficient DNA binding ability of these nanocomposites, thus validating the potential of rGO/PAH to be used as a non-viral gene delivery vector.

Biography

Amit Jaiswal is presently an Assistant Professor at the Indian Institute of Technology Mandi, India. He has completed his PhD in Nanotechnology from IIT Guwahati and Post-Doc from Washington University in St. Louis, USA and Technion – Israel Institute of Technology. His research interest is in the synthesis of nanomaterials for sensing, catalysis, drug delivery and diagnostic applications. He has published more than 10 papers in reputed journals.

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