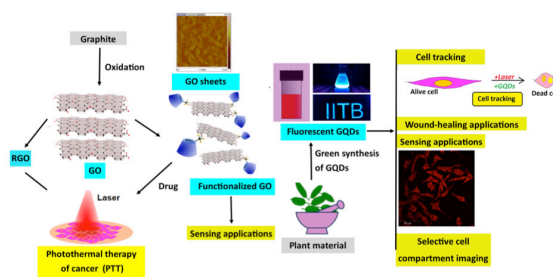


Graphene based nanomaterial for biomedical applications



Graphene and its family members for biomedical application

Graphene and its derivatives, graphene oxide (GO), reduced graphene oxide (RGO), and graphene quantum dots (GQDs) have drawn huge attention of researchers worldwide due to their amazing physicochemical properties for biomedical applications. GO and RGO have been used as a drug-carrier and photothermal agents for cancer therapy whereas GQDs have been employed for bioimaging and sensing applications.

Conventional cancer therapeutic techniques like chemotherapy cause side effects also, therefore, photothermal therapy for cancer has been explored extensively. Numerous photothermal agents have been explored during last decade. Many of them face the problems like toxicity, complicated functionalisation and transportation. So, the development of efficient and biocompatible photothermal agents was an imperative need for the time. For other biomedical applications like bioimaging and sensing applications, metallic quantum dots and other nanomaterial have been employed which has several drawbacks like bleaching and toxicity. So, it was essential to develop the biocompatible, photostable and highly sensitive nanomaterial for the bioimaging and sensing applications:

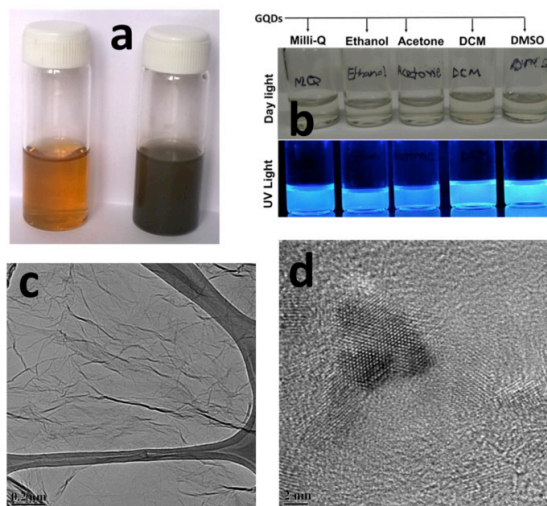
- Synthesis of graphene based drug carrier as well as photothermal agents
- Green synthesis of RGO and its application for cancer therapy
- Green synthesis of GQDs for bioimaging, cancer therapeutics, sensing and wound healing applications

We synthesise the graphene oxide and its derivatives through least toxic routes and functionalised them to make completely biocompatible. Our current work proposes a biocompatible, economic and scalable cancer therapeutic agents based on graphene oxide. Composite material helps in transportation, localisation, bioavailability and triggered release of the drug. We have also synthesised GQDs from different plant materials with different fluorescence properties which have been employed for selective cell-compartment imaging, temperature sensing, cell tracking and wound healing applications.

- Synthesised graphene based drug carriers and photothermal agents and their application in cancer therapeutics
- Green synthesis of GQDs, which have excellent optical properties, biocompatibility, photostability, and therapeutic properties
- Application of GQDs in selective bioimaging, cancer therapeutics, sensing, wound healing, and cell tracking
- Application of the graphene based nanomaterial for diagnosis and therapeutic applications

Cancer therapeutics

- Synthesis routes are nontoxic and feasible
- Our nanocarriers and photothermal agents are biocompatible and have advances over other metallic photothermal agents
- Drug-carriers exhibit excellent drug loading capacity and have triggered release property
- Bioimaging and sensing applications
- Intra-cellular sensing applications



(a) Aqueous stable dispersions of GO (left) and RGO (right); (b) Stable homogenous dispersion of GQDs in various solvents and their stable fluorescence property under UV irradiation; (c) FEG - TEM image of exfoliated GO; (d) FEG-TEM image of GQDs