Use of Graphene Quantum dot-Peptide-DOX conjugate for targeted therapy of ovarian cancer

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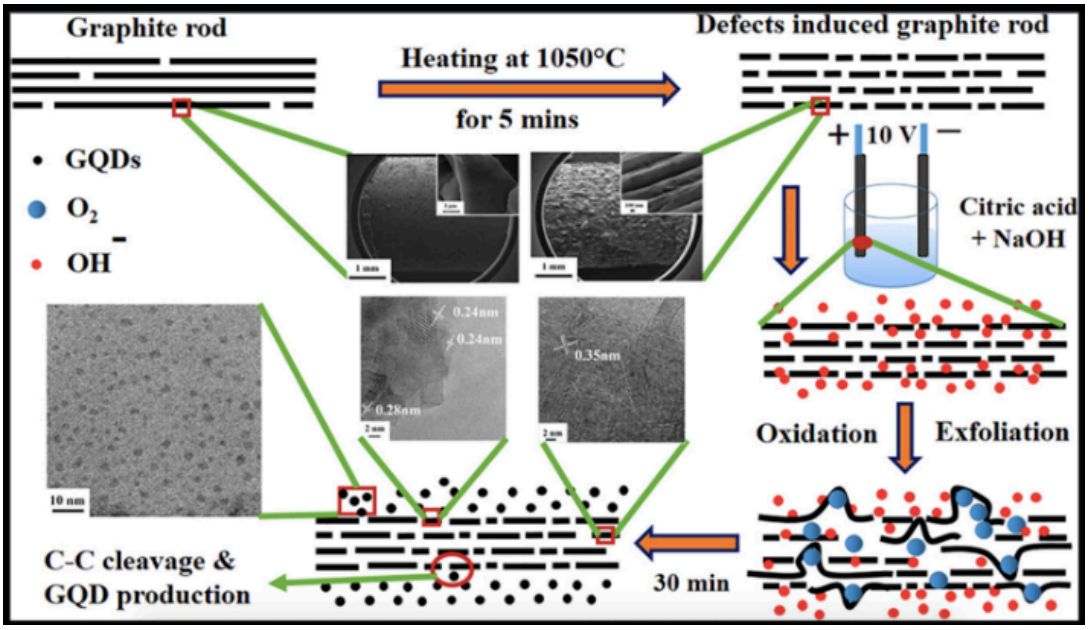
Specific problem being addressed: Intercalation of OH- ions, O2 production and exfoliation process result in the production of graphene quantum dots. The primary motivation of the project is to develop graphene-based carriers (which provide a large surface area) and load the peptide and the drug (preferably Doxorubicin) on it. This would preferentially deliver a larger concentration of the drug specifically to the resistant ovarian cancer cells compared to sensitive OC cells.



Project Summary: To overcome the drawbacks of the currently available therapies, we need a drug delivery system which has a hydrophilic feature, i.e. they can be easily dissolved/mixed in water. It should also possess properties such as several drug loading sites, small size, low cytotoxicity (toxicity to cells) etc. Towards this goal, we are proposing to develop peptide-linked Graphene Quantum Dot (GQD) particles which will be capable of targeted delivery of drugs (Doxorubicin) to drug-resistant ovarian cancer cells/tissues. GQDs are nano-sized ~5nm in size, hydrophilic in nature, have a large number of oxygen-rich functional groups and show very low cytotoxicity. These features make them a promising candidate for drug delivery. The figure is the schematic illustration of the electrochemical exfoliation of a defect-induced graphite rod. The specific objectives of this project include, synthesis of GQDs and conjugation of GQDS with Doxorubicin and Peptide.

Impact of this innovation: The primary motivation of the project is to develop graphene-based carriers (which provide a large surface area) and load the peptide and the drug (preferably Doxorubicin) on it. This would preferentially deliver a larger concentration of the drug specifically to the resistant ovarian cancer cells. Such targeted drug delivery technology has several advantages over traditional methods. It will significantly reduce the toxicity to

the healthier cell, and can specifically target cancer cells, thus improving the patient experience during the treatment period.