Indian Institute of Science

Centre for BioSystems Science and Engineering

Annual Work Presentation

At 4:00 PM on 26th November 2018 (Monday)

MRDG Seminar Hall, 1st Floor, Biological Sciences Building

GRAPHENE OXIDE BASED CANCER DIAGNOSTICS, IMAGING AND THERAPIES

Ms. Zinia Mohanta

Advisers: Prof. Chandan Srivastava and Prof. Hanudatta S. Atreya

Abstract

Magnetic resonance imaging (MRI) is a popular tool for diagnosis in medical science today. In spite of rendering an excellent imaging spatial resolution, MRI suffers from low sensitivity which often results in several diseases such as cancers remaining undetected in their early stages of development. In order to improve sensitivity and detection capabilities of MRI, inorganic nanoparticles are used as exogenous contrast agents (CAs).

Graphene oxide (GO) has been used earlier as a platform for loading T1 and T2 contrast agents (T1 and T2 being the timing parameters used for weighting MRI images). The physicochemical properties of GO depends on its oxidation level. We wanted to tune the oxygen content of GO and study the effect of oxidation level of GO on MRI contrast enhancement, drug loading efficacy, cytocompatibility and effectiveness in photothermal treatment.

We have developed a two-step methodology for improving the oxidation level of GO and have been able to correlate between defect density in mechanically milled graphite and total oxygen content of graphene oxide produced from oxidizing the milled graphite.

Further, we have probed the effect of GO on the relaxation properties of water using NMR and MRI studies and have found few GO show considerable MRI contrast. This intrigued us to decipher the origin of paramagnetism of GO which is enabling it to provide T1 and T2 contrast enhancement.

The objective of this project is designing GO based multimodal systems which can be used not only as contrast agents but also for cell targeting, drug delivery and photothermal therapy. Incorporating contrast agent, cell targeting agent, anti-cancer drug and photothermal agent on a common nanoplatform can play important role in theranostics for accurate diagnosis and targeted therapy.