National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Fabrication of Magnetic-Upconversion Nanoparticle for Multimodal Biomedical Application
Speaker	: Subham Kumar (Rollno : 523cy6002)
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Venue	: Seminar Room, Chemistry Department
Date and Time	: 04 Jun 2025 (11:00 AM)
Abstract	: Photon-activated therapy (PAT) and magnetic field-activated therapy (MAT) are two different strategies, which have recently emerged as promising and powerful tool for targeted and the non-invasive therapeutic approach with high spatiotemporal resolution. The conventional strategies for PAT, involving UV and visible light excitation suffer several drawbacks like poor tissue penetration depth, unavoidable light absorption and tissue damage. Interestingly, near infra-red (NIR) photon-mediated PAT approach has demonstrated promising potential as viable alternative for precise phototherapeutic applications. On the other hand, MAT approach uses magnetic field as a non-invasive trigger to activate or enhance the therapeutic effect based on hyperthermia, which is commonly shown by superparamagnetic nanoparticles. In this report, an attempt was made to develop a core-shell based Magnetic-Upconverting Nanoparticles (MUCNP&rsquos) that utilize Fe_3O_4 as the magnetic core and $NaErF_4$ as the NIR mediated upconverting shell. The MUCNPs were developed to achievesimultaneous regulation of upconverting and magnetic properties in dual-modal or multimodal nanoparticles that become a powerful and competitive tool in biological theranostics. Further, to enhance the luminescence intensity of the MUCNPs, the crystal field symmetry around the activator ion of the shell ($NaErF_4$) has been manipulated via doping with a non-lanthanide ion and a multi-shell design MUCNPs was developed by inert shelling of $NaYF_4$ on the Fe_3O_4@$NaErF_4$ MUCNPs. These MUCNP&rsquos are expected to show potential application combining the effect of PAT and MAT in the field of biomedicine.