National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Nano-engineered Bismuth based Graphitic Carbon Nitride composites pioneering antibiotic resistance combat
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Venue	: Chemistry Seminar Room
Date and Time	: 18 Jun 2025 (10.30 AM)
Abstract	: Since ancient times, the threat posed by bacterial genes through infection and contamination has jeopardized human health. In the contemporary world, antibiotic pollution represents a significant risk to both terrestrial and marine ecosystems, and it plays a crucial role in the emergence of antibiotic resistance in microorganisms, which subsequently affects humans. Numerous strategies encompassing precipitation, coagulation, ion exchange, reverse osmosis, membrane filtration, and biological methods have been used to combat antibiotic drug resistance in microorganisms. Nevertheless, these approaches often exhibit limitations such as low removal rates, time-consuming processes, limited scalability, high costs, and the generation of toxic by-products. Among the various strategies employed to address antibiotic resistance, photocatalysis stands out as one of the most environmentally friendly and efficient methods for generating reactive species under light irradiation to combat pollutants. This doctoral research investigates the latest advancements in the application of Bi-based gCN and engineered nanocomposites and nanofibers, along with their diverse synthesis techniques, aimed at the effective degradation of antibiotics. We have nano-engineered different Bi-gCN based hybrid nanocatalysts, like B-doped gCN/bismuth oxyhalide (BiOI/BCN-x), gCN/Ag-modified bismuth oxide (ABOG-x), Fe-doped gCN/defect induced Ti-MOF/bismuth complex (Bi_2MoO_6) based ternary nanocomposite (BTOF-x), and gCN/Fe_2O_3/Bismuth compound ($BiVO_4$) nanofibers for the photocatalytic removal of various persistent antibiotics like Tetracycline hydrochloride (TCH), Norfloxacin (NOR), Isoniazid (ISZ), Sulphanilamide (SNL), Amoxicillin (AMC) and Doxycycline (DOX) etc. Th fabricated photocatalysts have also been examined for various other applications like removal of organic dyes like Rhodamine (B), Cr(VI) removal, N_2 reduction, and antimicrobial activity under visible light irradiation, overall striving towards environmental remediation by mitigation of water pollutants. This might act as a reference for follow-up works to interpret the lacunae of previously reported literature works and construct highly efficient modified Bi-gCN nanocomposites, nanofibers, etc. for remediation of wastewater from antibiotics. This might contribute to unforeseen advancements in the fields of biomedical, environmental, photo-electrochemical, and nanomaterial design.