National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Grafting of Functionalized CNTs on the Surface of Carbon Fiber Through Electrophoretic Deposition for Improved Interfacial Mechanical Performance of the Carbon Fiber Reinforced Polymer Composites
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Venue	: Seminar Room (MM Dept.)
Date and Time	: 25 Aug 2025 (11 AM)
Abstract	: Carbon fiber reinforced polymer (CFRP) composites are highly regarded among fiber reinforced polymers (FRPs) due to their exceptional mechanical properties, making them ideal for demanding applications. However, the interface between the three phases in FRPs is typically the weakest point, which can lead to failure and reduce the overall strength of the composite under load. This issue can be addressed by modifying either the fiber or the matrix, often through the incorporation of nanofillers or by using electrophoretic deposition (EPD) techniques. This study focuses on modifying the surface of carbon fibers using EPD with CNT-COOH as the nano-filler. Before conducting the EPD process, Raman spectroscopy was employed to confirm the presence of CNT-COOH. In preliminary study it was observed that the flexural strength increased by ~20% and the flexural modulus was increased by ~12% when compared to neat CFRP. This improvement underscores the positive influence of CNT-COOH on the efficient stress transfer between epoxy matrix and carbon fibers. The topography of CNT-COOH grafted carbon fibers revealed that the surface roughness of carbon filaments increased significantly, which contributes in improving flexural performance by providing mechanical interlocking between carbon fiber and epoxy at the interface. Similarly, from the thermo-mechanical analysis of CNT-COOH grafted CFRP composites, the onset of glass transition (T_g) was found to be at ~112^{O}C. Optimizing the deposition parameters like deposition time, nano-filler concentration and applied current will yield CFRP composites with enhanced interlaminar shear, creep, and interlaminar fracture toughness performance, which are essential for critical applications.