National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Multi-Property Characterization of Aluminium Matrix Composites Derived from Recycled Aluminium Alloy
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Venue	: ME Seminar Hall (ME-001)
Date and Time	: 30 Jul 2025 (04:00 PM)
Abstract	: Aluminium Matrix Composites (AMCs) have garnered significant interest in materials science due to their superior mechanical properties, lightweight nature, and enhanced corrosion resistance compared to conventional aluminium alloys. This study focuses on the fabrication and comprehensive characterization of AMCs reinforced with 2 wt.% alumina (Al_2O_3) and varying weight percentages of cenosphere, using scrap aluminium alloy wheels as the matrix material. An ultrasonic-assisted stir casting process followed by squeeze casting was employed to ensure homogenous dispersion of reinforcements and improved bonding at the matrix-reinforcement interface. Six composite samples were casted and subjected to various thermal, structural, and electrochemical characterizations. Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) indicated enhanced thermal stability, with higher degradation temperatures observed in the reinforced composites. Fourier Transform Infrared Spectroscopy (FTIR) confirmed the presence of chemical bonding between the reinforcements and the aluminium matrix, suggesting strong interfacial adhesion. Residual stress analysis using X-ray Diffraction (XRD) revealed the presence of mild compressive stresses, which are beneficial in improving fatigue and mechanical performance. Corrosion behaviour was evaluated using potentiodynamic polarization tests, showing improved corrosion resistance in the composites compared to the base alloy. The synergistic effect of alumina and cenosphere reinforcements significantly enhanced the composite's thermal stability, and corrosion resistance. The use of recycled aluminium as the matrix also contributes to sustainability, making these AMCs promising candidates for lightweight and high-performance structural applications in the automotive and aerospace sectors.