National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Utilizing banana peel-derived biopolymers for sustainable environmental remediation and ecofriendly food packaging solutions
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Venue	: BM Department Seminar Room
Date and Time	: 18 Mar 2025 (03:00 PM)
Abstract	: Banana peel, a highly abundantly available lignocellulosic biowastes, consists primarily of cellulose, hemicellulose, lignin, pectin, and other extractives. This present study introduces a sustainable waste management strategy through an innovative sequential biorefinery approach, yielding pectin (11%) and Lignin (5%). Structural characterization using Fourier Transforms Infrared (FTIR), Scanning Electron Microscope (SEM), and X-ray diffraction (XRD) characterized the chemical and surface structure of these polymers. The lignin obtained from banana peel was utilized to develop biochar for the adsorption of textile wastewater. Comprehensive analysis using BET, FESEM, FTIR, XRD, and Raman spectroscopy identified the surface properties and functionalities of the biochar. The adsorption efficiency was evaluated with various dyes in batch mode under different conditions, such as biochar dose, pH, and contact time, providing a sustainable solution for the textile industry. Additionally, a biocomposite film was developed by combining b, sodium alginate, and plant extract. The physiochemical properties of the film showed that the integration of the plant extract increased moisture content, thickness, water solubility, and water vapor permeability while reducing the tensile strength The FTIR, XRD, and SEM confirm the chemical, surface morphology, and successful casting of the film. The biocomposite demonstrated hydrophilic properties and strong UV-barrier effectiveness, which were concentration-dependent. Moreover, the biocomposite exhibits excellent antimicrobial activity against bacterial species such as Bacillus sp. PhNs9, Pseudomonas sp. PhNs10, Enterobacter sp. Etk3 and E. coli while achieving 91% biodegradability in 28 days. These findings emphasize eco-friendly solutions for packaging and waste management, promoting industrial sustainability and circular economy principles. Keywords: Banana peel; Pectin; Lignin; Biocomposite; Biochar