National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Investigation on the Fermentation dynamics of Kombucha and Its Byproduct Optimization for Biomedical Applications
Speaker	: Baishali Dey (Rollno : 520bm1001)
Supervisor	: Sivaraman J.
Venue	: BM-140, Seminar Hall
Date and Time	: 20 Mar 2025 (03:15 PM)
Abstract	: Kombucha fermentation, an ancient preservation method, involves fermenting sweetened black or green tea with a symbiotic culture of yeast and acetic acid bacteria, resulting in physicochemical, biochemical, and microbiological transformations. These bio-transformations affect the aroma, color, taste and beneficial properties of the final end product. This study examines the fermentation dynamics, highlighting pH reduction due to organic acid production, sugar hydrolysis by yeast, and microbial growth indicated by total dissolved solids changes. Additionally, the study explores the production of kombucha-derived bacterial cellulose (KBC) by the acetic acid bacteria, an eco-friendly biomaterial with applications in food, biomedical, and industrial sectors. Optimization of fermentation conditions, including sugar and tea concentrations, surface area-to-depth ratio, and upscaling, significantly enhanced KBC yield. Purification of KBC was performed using a two-step process involving NaOH treatment followed by bleaching, where sodium hypochlorite, hydrogen peroxide, and sodium chlorite were evaluated for their impact on mechanical, structural, and surface properties. The study also assessed the influence of different drying techniques: microwave, hot air oven, and shade drying on KBC properties, optimizing conditions for enhanced physicomechanical characteristics. Furthermore, functionalization of KBC with phytochemical extracts demonstrated its potential as a wound dressing material, with ethanol-based turmeric extract exhibiting the highest antibacterial activity. Biocompatibility and hemocompatibility tests confirmed its suitability for medical applications. These findings contribute to advancing KBC as a cost-effective, sustainable biomaterial for biomedical applications.