National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Return Seminar-Green synthesis and characterization of zinc oxide nanoparticles from cottonseed cake
Speaker	: Kishore Kumar.G
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Venue	: CH-306
Date and Time	: 08 Jan 2025 (16.30)
Abstract	: Objective: Utilization of cottonseed cake waste, a by-product of the oilseed industry, for the green synthesis and characterization of zinc oxide nanoparticles as an active antimicrobial ingredient in food packaging. Methodology: Zinc oxide nanoparticles were synthesized by a green synthesis method using cottonseed cake extract. The effects of plant extract concentration (45%, 60% and 75% v/v) and different synthesis conditions, such as room temperature, high temperature, and ultrasound treatment, on the size, yield, and morphological characteristics of the synthesized nanoparticles were also evaluated. The nanoparticles were characterized by UV-Vis spectroscopy, XRD, FESEM, EDX, FTIR, Raman spectroscopy, particle size analyzer (DLS), zeta potential, antioxidant activity, and antibacterial activity analysis. Results and Conclusions: The UV characterization showed a characteristic peak absorbance in the wavelength range of 250 – 300 nm, indicating the formation of zinc oxide nanoparticles. The results were further confirmed by the XRD phase analysis, and show a crystalline size of 30 – 40 nm. The elemental composition of ZnO was confirmed by EDX analysis, and the functional groups of zinc oxide were identified by FTIR analysis at a wavenumber of 525 cm-1. Spherical and hexagonal shaped nanoparticles were obtained through the heat assisted and ultrasound assisted synthesis processes. The nanoparticles showed antibacterial activity against Gram positive bacteria (Staphylococcus aureus) and Gram negative bacteria (Escherichia coli). The green synthesized ZnO nanoparticles have the potential to be used as an active agent in food packaging materials to enhance the strength and provide antibacterial protection.