

Analysis on silica and graphene nanomaterials obtained from rice straw for antimicrobial potential

ABSTRACT

This study focuses on the encapsulation of silica and graphene nanoparticles and their potential applications. The encapsulation enhances the properties and effectiveness of these nanoparticles, with silica providing stability and graphene contributing to high surface area and electrical conductivity. Characterization of silica-graphene nanoparticles was conducted using various techniques including High Power Microscope (HPM), Scanning Electron Microscope (SEM), Energy-dispersive X-ray spectroscopy (EDS), and 3D Nano Profiler. The antimicrobial activity of silica, graphene, and silica-graphene nanoparticles was evaluated using a disc diffusion assay against *E. coli* and *B. subtilis* at varying concentrations. Results showed significant antimicrobial activity, with the inhibition zone being directly proportional to the concentration. Silica-graphene nanoparticles demonstrated higher efficacy against *E. coli* compared to *B. subtilis*, attributed to differences in cell wall structure. Statistical analysis using ANOVA confirmed significant differences in antimicrobial activity among the tested components.