

A Comparative Study on the Synthesis, Characterizations and Biological (Antibacterial and Antifungal) Activities of Zinc Doped Silica Oxide Nanoparticles Based on Various Solvents

Authors : Muhammad Arshad, Ghulam Hussain Bhatti, Abdul Qayyum

Abstract : Zinc-doped silica oxide nanoparticles having size 7.93nm were synthesized by the deposition precipitation method by using different solvents (acetonitrile, n-hexane, isoamylalcohol). Biological potential such as antibacterial activities against *Bacillus subtilis* and *Escherichia coli*, and antifungal activities against *Candida parapsilosis* and *Aspergillus niger* were also investigated by Disc diffusion method. Different characterizations techniques including Fourier Transmission Infrared Spectroscopy (FT-IR), X-ray diffraction (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Thermo-gravimetric Analysis (TGA), Atomic force microscopy (AFM), and Dynamic Light Scattering (DLS) were used. FT-IR characterization confirmed the presence of metal oxide bond (SiO₂) while XRD showed the hexagonal structure. SEM and TEM characterization showed the morphology of nanoparticles. AFM study showed good particle size distribution as depicted by a histogram. DLS study showed the gradual decrease in the size of nanoparticles from 24.86nm to 13.24 nm. Highest antibacterial activities revealed by acetonitrile solvents (6% and 4.5%) followed by isoamylalcohol (3% and 2.4%) while n-hexane solvent showed the lowest activity (2% and 1%) respectively. Higher antifungal activities exhibited by n-hexane (0.34 % and 0.43%) followed by isoamylalcohol (0.27% and 0.19%) solvent while acetonitrile (0.21% and 0.17%) showed least activity respectively. Statistical analysis by using one-way ANOVA also indicated the significant results of both biological activities.

Keywords : nanoparticles, precipitation methods, antibacterial, antifungal, characterizations

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