

Synthesis of ZnO nanoparticles with chitosan as stabilizing agent and their antibacterial properties against Gram-positive and Gram-negative bacteria

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ABSTRACT

Antibacterial activity of zinc oxide (ZnO) nanoparticles have received significant interest, particularly by the implementation of nanotechnology to synthesize particles in nanometer region. ZnO nanoparticles were successfully synthesized through microwave heating by using chitosan as a stabilizing agent and characterized by UV-vis, FTIR, XRD and FESEM-EDX. The aim of the present study is to determine the antibacterial activity of ZnO nanoparticles against Gram-positive bacterium *Staphylococcus aureus* (*S. aureus*) and Gram-negative bacterium *Escherichia coli* (*E. coli*). The antibacterial effect of ZnO nanoparticles was investigated for the inhibition zone and inactivation of cell growth. The absorption of ZnO nanoparticles was found to be around 360 nm. FTIR results showed the stretching mode of ZnO nanoparticles at 475 cm^{-1} of the absorption band. EDX results indicated that ZnO nanoparticles have been successfully formed with an atomic percentage of zinc and oxygen at 23.61 and 46.57% respectively. X-ray diffraction result was confirmed the single-phase formation of ZnO nanoparticles and the particle sizes were observed to be around 50 to 130 nm. The results showed that ZnO nanoparticles have displayed inhibition zone of 16 and 13 mm against *S. aureus* and *E. coli* respectively. Gram-negative bacteria seemed to be more resistant to ZnO nanoparticles than Gram-positive bacteria.

Keywords: Zinc oxide; Nanoparticle; Microwave; Chitosan; Antibacterial