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Sol-gel, hydrothermal and combustion synthetic methods of zinc oxide nanoparticles and their modification with polyaniline for the production of antimicrobial nanocomposites

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Zinc oxide nanoparticles (ZnO NPs) have attracted much medical attention as antibacterial agents through their ability to produce reactive oxygen species (ROS) under ultraviolet light. Conducting polymers can enhance the photocatalytic efficiency of ZnO NPs by expanding their absorption in the Vis region. In this article, ZnO NPs were prepared and characterized using three different chemical routes; sol-gel, hydrothermal, and combustion methods. The effect of calcination temperature on their properties had been generally investigated. ZnO NPs prepared from the combustion method at 750oC was modified with (10%, 15%, and 20%) polyaniline (PANI) by in situ polymerization of aniline on a dispersion of ZnO NPs to produce PANI/ZnO nanocomposites (NCs) NC10, NC15, and NC20, respectively. Characterization of the synthesized NCs was carried out by FTIR, XRD, TEM, and SEM. Their antibacterial efficiency toward Escherichia coli (G-) and Staphylococcus aureus (G+) and antifungal activity to Aspergillus flavus and Candida albicans were evaluated. The NCs revealed medium antibacterial activity where NC15 showed the highest activity to Staphylococcus aureus (G+) and Candida albinos, however, no efficiency was detected against Aspergillus flavus.

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