

Arabic Gum as Green Agent for ZnO Nanoparticles Synthesis: Properties, Mechanism and Antibacterial Activity

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Abstract: The size and morphology of ZnO nanoparticles (ZnO NPs) were controlled in the presence of the natural and green agent, Arabic gum. Lower amounts of Arabic gum showed a greater effect on the size and morphology as well as on the properties of ZnO NPs prepared by a sol–gel method. The hexagonal wurtzite crystal structure was found for all samples ZnO NPs with no other phase for impurities. The size of the spherically shaped ZnO NPs decreased with an increase in the amount of Arabic gum, up to an optimal 1.50 wt%. The smaller size of ZnO NPs of 16 nm was obtained with the optimal amount of Arabic gum, compared to 32 nm produced without Arabic gum. These results were attributed to the ready reaction between Arabic gum molecules and zinc ions within the nucleation and growth processes of ZnO NPs. The optical properties of ZnO NPs, with a band gap of 3.4 eV and enhanced intensity of blue emission, were the result of the smaller size of ZnO at the optimal amount of Arabic gum. According to the experimental results, a mechanism to elucidate the formation of ZnO NPs was proposed and explained. The antibacterial activity was tested against *Escherichia coli* against which higher activity, explained by smaller size of the ZnO NPs, was obtained.

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