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COMPARATIVE STUDY OF MgO NANOPARTICLES SYNTHESIZED IN THE PRESENCE OF SODIUM DODECYL SULPHATE AND ALOE VERA

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Abstract. Magnesium oxide (MgO) nanoparticles were synthesized using two distinct stabilizing agents-sodium dodecyl sulphate (SDS) and Aloe Vera extract (AVE)-in order to evaluate how electrostatic versus biopolymeric stabilization affects nucleation, crystallite formation, and final structural properties. The nanoparticles were obtained through a precipitation route followed by calcination at 500–1100°C. XRD analysis confirmed the formation of nanocrystalline MgO, with the crystallite size being slightly influenced by the choice of stabilizing agent. SDS promoted electrostatic micellar templating, resulting in faster nucleation and smaller but defect-richer crystallites, whereas Aloe Vera acted as a steric capping agent that delayed supersaturation and enabled more ordered crystal growth. FTIR and XPS analyses revealed temperature-dependent dehydroxylation and surface carbonation effects, consistent with nanoscale MgO chemical reactivity. The optical bandgap ranged from 5.4 to 6.0 eV, exhibiting a blue shift relative to bulk MgO due to nanoscale confinement and surface defect states. Overall, the results demonstrate that the precipitation environment plays a decisive role in controlling MgO crystallization kinetics, defect chemistry, and nanoparticle stability, with Aloe Vera providing superior steric stabilization against agglomeration compared to SDS.

Keywords: MgO nanoparticles, sodium dodecyl sulphate, Aloe Vera, the coprecipitation method.

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