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(54) Title of the invention : MICROWAVE-ASSISTED GREEN SYNTHESIS OF MULTIFUNCTIONAL CuO/Cu₂O-ZnO NANOCOMPOSITES

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(57) Abstract :

The present invention discloses a microwave-assisted green synthesis method for producing morphology-controlled multifunctional CuO/Cu₂O-ZnO nanocomposites using Ipomoea carnea leaf extract. Systematic variation of copper acetate and zinc acetate precursor ratios (90:10, 80:20, 70:30, 60:40) under optimized microwave conditions (2.45 GHz, 700W, 20 minutes) yields distinct morphologies: star-shaped (8-12 nm), spherical (15-25 nm), and flower-like (30-50 nm) structures. The nanocomposites demonstrate exceptional multifunctional performance including photocatalytic degradation efficiency up to 98.90% for organic dyes, antioxidant activity reaching 99.77% DPPH scavenging, and broad-spectrum antibacterial properties with inhibition zones of 14-18 mm. Tunable band gap energies (1.47-2.9 eV) enable application-specific optimization. The eco-friendly synthesis eliminates toxic chemicals, reduces processing time by 95%, and provides scalable production suitable for industrial wastewater treatment, antimicrobial coatings, and biomedical applications.

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