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Preparation, Characterization and Catalytic Activity of Gelatin-Stabilized Copper Nanoparticles

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Synthesis of copper nanoparticles was carried out with gelatin as a stabilizer by reducing $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ions using hydrazine. Ascorbic acid and aqueous NaOH were also used as an antioxidant and pH controller, respectively. The effects of NaOH, hydrazine, concentration of gelatin as stabilizer were studied. The synthesized copper nanoparticles were characterized by UV-visible spectroscopy (UV-vis), powder X-ray diffraction (XRD), zeta potential measurements, fourier transform infrared spectroscopy (FTIR), energy dispersive x-ray (EDX), field emission scanning electron microscopy (FESEM) and transmission electron microscope (TEM). The formation of CuNPs@Gelatin is initially confirmed by UV-vis spectroscopic analysis with the characteristics band at 583 nm. XRD and TEM reports revealed that CuNPs@G4 is highly crystalline and spherical in shape with optimum average size of 4.21 ± 0.95 nm. FTIR onto the surface which is further supported by zeta potential measurements with the negative optimum value of -37.90 ± 0.6 mV. The CuNPs@G4 showed good catalytic activity against MB reduction using NaBH_4 as reducing agent in an aqueous solution. The best enhanced properties of CuNPs@G4 were found for the 0.75 wt. % gelatin concentration. Thermodynamic parameters (ΔH and ΔS) indicate that under the studied temperature, the reduction of MB by CuNPs@G4 is not feasible and had endothermic in nature.

Biography:

Aminu Musa has completed his PhD in 2017 from the University Putra Malaysia, Malaysia under TETFUND Nigeria Scholarship. He is now lecturer I in the department of Pure and Industrial Chemistry, Umaru Musa Yar'adua University, Katsina, Nigeria and has been doing research in synthesis of nanocrystalline cellulose from the agricultural waste. His research interests in preparation of metal nanoparticles supported on biopolymers for catalytic and antimicrobial applications. He has published papers in international reputed journals.