Studies on copper ferrite thin film for supercapacitor application

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Abstract
Copper ferrite ($CuFe_2O_4$) thin films with were synthesized using a hydrothermal method and explored for supercapacitor applications. X-ray diffraction (XRD), confirmed formation of a crystalline spinel ferrite phase. The elemental composition and stoichiometry were verified using energy-dispersive X-ray analysis (EDAX). Surface morphological studies carried out using scanning electron microscopy (SEM) revealed agglomerated nanoparticles with an average particle size of approximately 200 nm. Fourier transform infrared spectroscopy (FTIR) further confirmed the formation of copper ferrite through the presence of characteristic metal-oxygen vibrational bands corresponding to Cu-O and Fe-O bonds. The electrochemical performance of the $CuFe_2O_4$ thin-film electrodes were evaluated using cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) measurements. The electrodes exhibited clear pseudocapacitive behavior with a high specific capacitance of 308 F g^{-1} at a current density of 1 A g^{-1}. These results demonstrate that hydrothermally synthesized $CuFe_2O_4$ thin films are promising electrode materials for high-performance supercapacitor applications.