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Facile synthesis of nanosheet-like CuO film and its potential application as a high-performance pseudocapacitor electrode

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ABSTRACT:

We describe the chemical synthesis of binderless and surfactant free CuO films for pseudocapacitive applications. Nanosheet-like and nanorod-like CuO films are deposited on indium tin oxide (ITO) substrates using the successive ionic layer adsorption and reaction (SILAR) approach. The nanostructured CuO shows uniform surface morphology and uniform pore distribution with average grain sizes in the range 30 - 50 nm and average pore size of 12.0 and 12.5 nm for 10 and for 40-cycles respectively, as estimated from AFM imaging. The electrochemical properties are characterized by cyclic voltammetry (CV), galvanostatic charge-discharge (GCD) and electrochemical impedance spectroscopy (EIS). The highest specific capacitance of 566.33 Fg-1 is obtained for as low as 10-cycle film at a scan rate of 5mVs-1. The long term stability tests by continuous GCD, indicates that there is no degradation after 1000 cycles with the film yielding 100% coulombic efficiency. This indicates a high stability of the synthesized CuO films. Hence, the developed nanostructured CuO film electrodes exhibit excellent properties for use as supercapacitors.