Chemical synthesis of nano-grained ytterbium sulfide thin films for supercapacitor application

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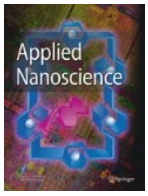

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Abstract

Nano-grained ytterbium sulfide (Yb_2S_3) thin film is deposited by an inexpensive chemical bath deposition (CBD) method with excellent supercapacitive performance. The formation of Yb_2S_3 thin film is confirmed from XRD, FT-Raman, and XPS studies. The nano-grains like surface morphology of Yb_2S_3 thin film is observed using scanning electron microscopy and transmission electron microscopy techniques. The Yb_2S_3 film shows hydrophilic nature with a contact angle value of 61.2°. The electrochemical supercapacitive properties of Yb_2S_3 thin film are studied using cyclic voltammetry (CV), galvanostatic charge–discharge (GCD), and electrochemical impedance spectroscopy (EIS) techniques. The Yb_2S_3 thin film exhibits a specific capacitance of 184.6 F g^{-1} in 1 M KOH electrolyte at a 5 mV s^{-1} scan rate. The symmetric solid-state supercapacitor device of configuration Yb_2S_3/KOH-PVA/Yb_2S_3 shows a specific capacitance of 15 F g^{-1} and