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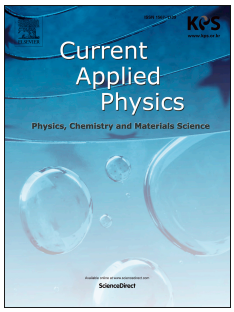

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Effect of Electrodeposition Modes on Ruthenium Oxide Electrodes for Supercapacitors

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Abstract

With developments in energy storage devices, supercapacitors are gaining more attraction because of their potential to excel batteries shortly. In this work, ruthenium oxide (RuO_2) has been deposited on stainless steel and studied the influence of surface modification of solid electrodes on capacitance properties. Hydrous ruthenium oxide was plated by different modes such as potential sweep method (cyclic voltammetric), constant potential method (chronoamperometry) and optimised potential pulse method using a recently reported precursor material namely ruthenium nitrosylsulfate (RuNS). The structural information and morphology of electrodeposits were characterised by X-ray diffractometer and scanning electron microscope respectively. The XRD studies indicate a poor crystalline state for RuO_2 in all the modes of deposition but can contribute to a higher surface area when compared to a highly crystalline form. The SEM analysis revealed the formation of surface modification concerning the change of potential mode. Mud-cracked morphology, spherical particles and dendrimeric morphology observed on chronoamperometry, potential pulse and cyclic voltammetry respectively. Electrochemical studies were also conducted on the samples to assess their performance for supercapacitor applications. The spherical particles of hydrous RuO_2 show high performance of capacitance behaviour 1180 F/g in 0.5 M H_2SO_4 at the scan rate of 5 mV/s. Dendrimeric morphology and mud-cracked morphology shows 573 F/g and 546 F/g respectively in same 0.5 M

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