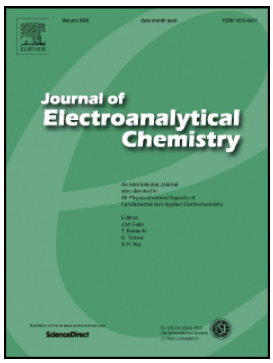

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In Situ Encapsulation of Tin Oxide and Cobalt Oxide Composite in Porous Carbon for High-Performance Energy Storage Applications

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Abstract

Herein, we report the preparation of porous carbon from palm kernel shell and loading of tin oxide-cobalt oxide in its pores using a facile in-situ encapsulation synthesis strategy. The as-synthesized SnO_2/Co_3O_4@C composite was characterized by powder X-ray diffraction, X-ray photoelectron spectroscopy and field-emission scanning electron microscopy techniques. Electrochemical charge storage capabilities of the composite were measured using cyclic voltammetry, charge-discharge cycling and electrochemical impedance spectroscopy in aqueous 6 M KOH and 1 M Na_2SO_4 electrolytes. The SnO_2/Co_3O_4@C composite showed over 70% higher specific capacitance (177 F g^{-1}) than the pure porous carbon (106 F g^{-1}) in 6M KOH. Among these electrolytes, the composite exhibited an enhanced electrochemical performance in KOH electrolyte due to its smaller hydrated ion radius, high ionic mobility and lower equivalent series resistance than Na_2SO_4.

Key words: Porous carbon, composite, electrolytes, specific capacitance, energy and power density.