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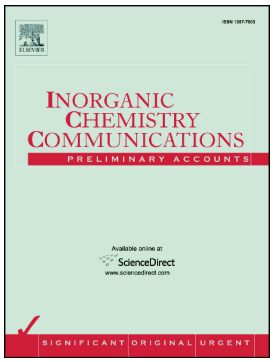

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Synthesis of porous sponge-like Na_2FePO_4F/C as high-rate and long cycle-life cathode material for sodium ion batteries

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Abstract

Porous sponge-like Na_2FePO_4F/C nanocomposite was successfully synthesized via a sol-gel method. The structure, morphology and electrochemical performance of the as prepared materials were studied by X-ray diffraction (XRD), scanning electron microscopy (SEM) and charge/discharge measurements. The effects of molar ratio of Fe^{3+} ion to oxalic acid on the structrue, morphology and electrochemical properties of Na_2FePO_4F/C nanocomposites were systematically investigated. The porous sponge-like Na_2FePO_4F/C nanocomposite possessed good crystallization, large specific surface areas and in situ carbon-coating, which led to a high capacity of up to 64.7 mAh g^{-1} and 115.5 mAh g^{-1} at 5 C and 0.1 C rates respectively. When applied as a cathode material for sodium-ion batteries, it also showed a good cycling stability with a capacity retention of ~82.6% after 1000 charge-discharge cycles at the rate of 0.5 C. The exceptional structural stability and good electrochemical performance of nanocomposites might meet their potential use as high-performance cathode materials.

Keywords: Sodium-ion batteries; Na_2FePO_4F; cathode; Porous sponge structure; sol-gel method