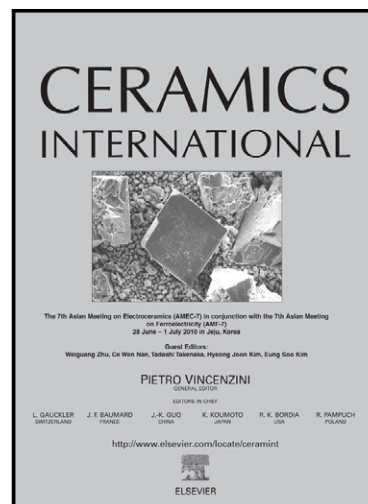


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Electrochemical Performance of $\text{LiFePO}_4@C$ Composites with Biomorphic Porous Carbon Loading and Nano-Core-Shell Structure

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Abstract

Effect of biomorphic porous carbon (BPC) addition on the composition, microstructure, and electrochemical performance of $\text{LiFePO}_4@C/C$ composites was investigated. Results indicated that network pores of BPC were almost completely filled by $\text{LiFePO}_4@C$ nanoparticles, which were formed by an olivine structure LiFePO_4 core with size that ranged from 58.6 nm to 80.1 nm and an amorphous carbon shell with a thickness of approximately 2 nm. Double electrical conductive networks formed in the composites improved the electrical properties of samples from $2.59 \times 10^{-6} \text{ S}\cdot\text{cm}^{-1}$ (sample A-0) to $5.76 \times 10^{-2} \text{ S}\cdot\text{cm}^{-1}$ (samples A-20). Synergy effect of electric double layer energy storage produced by BPC and lithium-ion extraction/insertion energy storage by LiFePO_4 clearly reduced the capacity reduction rate of composites, and obtained a charge/discharge capacity of 114.2/110.5 $\text{mA}\cdot\text{h}\cdot\text{g}^{-1}$ (samples A-5) at 10C. Moreover, addition of BPC showed a significant advantage in reducing the interfacial resistance of the electrode reaction in composites from 86.72 Ω (samples A-0) to 37.58 Ω (samples A-20). The electrical conductive mechanism of $\text{LiFePO}_4@C/C$ composites is discussed.

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