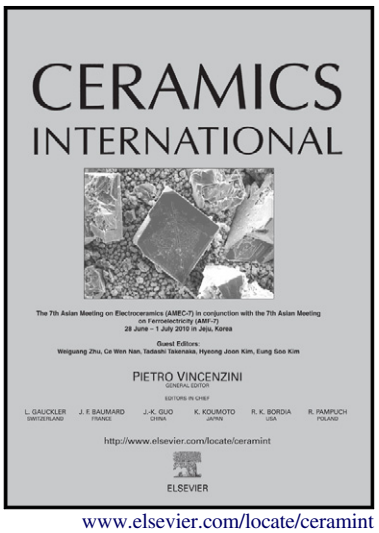

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Electrochemical Performance of $LiFePO_4$@C Composites with Biomorphic Porous Carbon Loading and Nano-Core-Shell Structure

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Abstract

Effect of biomorphic porous carbon (BPC) addition on the composition, microstructure, and electrochemical performance of $LiFePO_4$@C/C composites was investigated. Results indicated that network pores of BPC were almost completely filled by $LiFePO_4$@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 2.59×10^{-6} S·cm^{-1} (sample A-0) to 5.76×10^{-2} S·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 mA·h·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 $LiFePO_4$@C/C composites is discussed.