Hollow Structured LiFePO₄/C Microspheres in situ Prepared by a One-Pot Template-Free Method as Cathode for Lithium-Ion Batteries

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The effective control of the nanostructure is recognized as an effective method for improving the electrochemical performance of the LiFePO₄ cathode; nevertheless, it is still a great challenge to simultaneously achieve high tap density and excellent electrochemical performance. Herein, we develop a hydrothermal method combined with a sintering process to synthesize monodispersed LiFePO₄/C microspheres with an open channel interior. The microsphere assembled of ultrathin nanosheets shows a unique hollow structure with open channel which endows the hollow LiFePO₄/C with a good balance of high specific surface area (28.9 m² g⁻¹) and tap density (1.2 g cm⁻³), revealing prospect of the promising application. This sample with 2.6 wt% in-situ carbon coating exhibits a superior reversible capacity. At high current densities of 5 and 10 C, discharge capacities of 115 and 93.5 mAh g⁻¹ could be obtained, respectively, indicating excellent rate performance of the as-prepared hollow LiFePO₄/C sample. The superior lithium storage performance should originate from the accelerated charge transfer and Li-ion diffusion from the unique hierarchical hollow microsphere structure, as well as from the improved electronic conductivity ascribed from the in-situ carbon coating. This work highlights that the structure-based design is an effective approach to achieve superior lithium storage performance together with high tap density for LiFePO₄ cathode material.

Keywords: Open hollow channel; High tap density; Superior lithium storage performance; Lithium ion batteries.

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