Synthesis and Electrochemical Properties of Fe-Doped LiMnPO₄ Nanocomposite Prepared by a Hydrothermal Process in a High-Pressure Reactor

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LiMn₁₋ₓFeₓPO₄ powders with varied Fe concentrations (x=0, 0.2, 0.3, 0.4) were prepared in a high-pressure reactor by a hydrothermal process. The effect of the Fe dopant concentration on the crystal structure, morphology, surface area and electrochemical properties were studied. LiMn₁₋ₓFeₓPO₄ with a higher Fe concentration presented better cyclic performance, and the capacity retention of a LiMn₀.₆₀Fe₀.₄₀PO₄ electrode after 20 cycles was 97.2% at 25°C with an initial capacity of 145 mAh/g at a 0.1C rate. LiMn₀.₆₀Fe₀.₄₀PO₄ also delivered discharge capacities of 151 mAh/g and 109.3 mA h/g at rates of 0.05C and 5C, respectively. Because the total charge/discharge capacity of LiMn₁₋ₓFeₓPO₄ was enhanced as the Fe concentration increased while the average discharge voltage was reduced, a high specific energy value of 513 Wh/kg was achieved in the LiMn₀.₇₀Fe₀.₃₀PO₄ material.

Keywords: Hydrothermal process; LiMn₁₋ₓFeₓPO₄; Lithium-ion battery; Cation doping

FULL TEXT

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