Synthesis and Electrochemical Properties of Spinel LiCrTiO$_4$ and Its Application in LiFePO$_4$/LiCrTiO$_4$ Full Cells

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Spinel structure LiCrTiO$_4$ was prepared through a solid-state reaction using Li$_2$CO$_3$, Cr$_2$O$_3$, and TiO$_2$ as raw materials. X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), transmission electron microscopy (TEM), scanning electron microscopy (SEM) was used to characterize the structure of LiCrTiO$_4$. Electrochemical properties of LiCrTiO$_4$ were studied by cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and charge-discharge cycling performance. Electrochemical testing showed that LiCrTiO$_4$ has an excellent electrochemical capacity of 164 mAh·g$^{-1}$ at a 0.5C-rate, and 116.1mAh·g$^{-1}$ at a 10C-rate with stable cycling performance. Furthermore, LiFePO$_4$/LiCrTiO$_4$ full cells were constructed using LiCrTiO$_4$ as the anode electrode that displayed superior cycling stability at high rates. The LiFePO$_4$/LiCrTiO$_4$ full cell exhibited a charge capacity of 136.6mAh·g$^{-1}$ and discharge capacity of 116mAh·g$^{-1}$ at a 0.2C-rate, and 96.4mAh·g$^{-1}$ at 2C-rate.

Keywords: Carbothermal reduction, LiCrTiO$_4$ LiFePO$_4$/LiCrTiO$_4$ full cell, Solid state reaction

FULL TEXT

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