Synthesis and Electrochemical Properties of Flower-like Na-doped V_6O_{13} Cathode Materials for Li-ion Batteries

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Flower-like $Na_xV_6O_{13}$ samples ($x=0\sim0.535$) are fabricated via a typical hydrothermal method followed by annealed process at 350°C for 1h in argon atmosphere. The phase structure, chemical composition, morphology and element valence of prepared samples are characterized by XRD, XPS, FESEM and EDS. The electrochemical properties of prepared samples are measured by CV, EIS and charge-discharge analyses. These results demonstrates that the enhancement of electrochemical reversibility in Na-doped V_6O_{13} cathode materials are attributed to its high total conductivity, low charge transfer resistance and better electrochemical reversibility. In addition, both crystal domain size and the lithium diffusion coefficient of the Na-doped V_6O_{13} samples are influenced by the added amount of $NaNO_3$. When the doped molar ratio of Na^+ to V_6O_{13} is 0.321/1, the product presents hierarchical flower-like microsphere morphologies, which is assembled by interconnected nanorods. It demonstrates the best electrochemical performance with initial discharge capacity of 422.47mA·h/g. After 100cycles, the discharge capacity and capacity retention of $Na_{0.321}V_6O_{13}$ are 215.30mA·h/g and 51% respectively.

Keywords: Cathode Materials; Li-ion Batteries; V_6O_{13} ; Na-doping

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