Preparation of LiFePO_4 using iron(II) sulfate as product from titanium dioxide slag purification process and its electrochemical properties

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To further reduce the production cost of LiFePO_4 cathode material and promote the resource utilization of titanium dioxide slag solid waste, this paper chose titanium dioxide slag rich in iron(II) sulfate as raw material. After purification, it prepared LiFePO_4 and studied the differences in composition, structure, morphology and electrochemical properties of LiFePO_4 prepared from a commercially available battery-grade iron(II) sulfate as a comparison sample. The results showed that the purity of iron(II) sulfate in the purified titanium dioxide slag could reach 99.97% by using a composite precipitant formulated with ammonium bifluoride and reduced iron powder. LiFePO_4 prepared from it has an olivine structure with a micron-sized short rod shape. The first charge/discharge specific capacities were 161.55 and 159.33 mAh/g at 0.1C multiplier respectively. The coulomb efficiency reached 98.63%. After 200 cycles of charge/discharge at 1C multiplier, the capacity retention was still 95.05%, which was similar to the electrochemical performance of LiFePO_4 prepared from battery-grade iron(II) sulfate. The results of this paper indicate that the preparation of LiFePO_4 from titanium dioxide slag purification has good prospects for industrial application and may become a new way to solve the problem of solid waste utilization of titanium dioxide slag.

Keywords: titanium dioxide slag, iron(II) sulfate, LiFePO_4 , performance

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