Facile Synthesis of LiFePO_4/C with High Tap-density as Cathode for High Performance Lithium Ion Batteries

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LiFePO_4/C cathode materials with a high tap-density originated from $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ precursors were prepared via a high-temperature solid-phase carbothermic reduction using low-cost Ferroferric oxide (Fe_3O_4) and phosphoric acid (H_3PO_4) as reaction materials. The as-obtained precursors are consistent with $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ phase with a Pcab space group and no impurity peaks are detected by XRD. The $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ precursor prepared at 90°C for 8 h and the corresponding LiFePO_4/C composite show high tap-density of 1.45 g cm^{-3} and 1.36 g cm^{-3} , respectively. The LiFePO_4/C delivers a high initial discharge capacity of 159 mAh g^{-1} at 0.1 C. Meanwhile, an initial capacity of 95 mAh g^{-1} and superior capacity retention of 96.3 % are retained after 70 cycles at a high rate of 10 C.

Keywords: LiFePO_4/C , $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ precursors, Fe_3O_4 , lithium ion batteries

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