Supercritical Water Hydrothermal Synthesis of Zn_2SnO_4 Anode Material for Lithium-Ion Batteries

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Zn_2SnO_4 anode powders were successfully synthesized using supercritical water (SCW) and a metal salt solution in a 10-minute reaction. Effects of NaOH concentration, Zn to Sn ratio, and synthesis temperature were studied using a SCW batch reactor. Alkaline solution concentration and synthesis temperature played a key role in the production of single-phase Zn_2SnO_4 powders. At the solution of 0.3 M NaOH and a molar ratio of Zn:Sn = 2:1 under a supercritical temperature of 400°C, the average size range of the pure Zn_2SnO_4 powders was 0.5 μm to 1.0 μm, and the morphology was nearly uniform and cubic-like in shape. The initial specific discharge capacity of the Zn_2SnO_4 powders prepared at this condition was 1526 mAh/g at a current density of 0.75 mA/cm^2 in 0.05-3.0 V, and their irreversible capacity loss was 433 mAh/g. The discharge capacities of the Zn_2SnO_4 powders decreased with cycling and remained at 856 mAh/g after 50 cycles, 56% of the initial capacity.