Synthesize Lithium Titanate with High-Rate Performance in Supercritical Fluid

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Lithium titanate (Li4Ti5O12, LTO) particle as a potential material for large-scale lithium ion battery applications have been synthesized in supercritical water (scH2O) and supercritical methanol (scMeOH) (400 oC and 300 bar) followed by calcinations at temperatures of 600-800 °C in air. Nanosized LTO particles with a high crystallinity were produced in supercritical water while mesoporous structure were produce in supercritical methanol. Calcination was performed to increase the crystallinity of the particle. The mesoporous LTO exhibited large surface areas of 50-100 m2/g while LTO produced in scH2O exhibited well-faceted structure with surface areas of 10-38 m2/g. The LTO retained a high electrochemical capacity of 160 mAh g−1 at 1 C and stable cycleability up to 400 cycles. Even at a high current density of 1750 mA g−1 (10 C), the discharge capacity still retained a high value (108 mAh g−1). The particle properties and the electrochemical performance of LTO prepared in scH2O and scMeOH were compared with those from a conventional solid-state method.