

Electrochemical Performance of Lithium Titanate Synthesized by Supercritical Hydrothermal Synthesis

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Lithium Titanate (Li₄Ti₅O₁₂, LTO) powders were successfully synthesized in supercritical water condition in 400 oC and 30 MPa with 15 min – 6 hours reaction time with or without calcination. As-synthesized LTO particles are flaky and highly porous in nature with a surface area of 12 – 40 m²/g. Transmission electron micrographs indicate the primary particles to be agglomerated crystallites of varying size between 20 and 50 nm. Effect of residence time and concentration of precursor were studied with a supercritical water batch reactor. Precursor concentration and residence time played a key role in the production of single-phase Li₄Ti₅O₁₂ powders. The XRD pattern was confirm that as-synthesized particle have Li₄Ti₅O₁₂ pattern with small amount of TiO₂ impurities. The good electrochemical performance is ascribed to nanoparticle morphology of the electrodes that provide short diffusion – paths for Li⁺ for insertion/ deinsertion process. The Li₄Ti₅O₁₂ electrodes also exhibit promising capacity retention with little capacity loss over 50 cycles at varying discharge rates.