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Lithium titanate as anode material for lithium ion batteries: synthesis, post-treatment and its electrochemical response

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Abstract

The relationship between the structure and crystallinity of lithium titanate $Li_4Ti_5O_{12}$, at different synthesis post-treatment conditions on the electric energy storage capacity is discussed. $Li_4Ti_5O_{12}$ was synthesized by solid-state reaction at a high temperature and time (950 °C, 24 h) and the resulting material was post-treated with a ball milling process at different times. Additional samples were prepared with a post-calcination after and adding graphite carbon previously to the longer applied ball-milling time. All the obtained materials were structurally and morphologically characterized by XRD and SEM techniques. To study the effect of ball milling time on the lithium-ion storage capacity, electrochemical experiments of galvanostatic charge-discharge cycling, cyclic voltammetry, and rate capability experiments were performed. The application of high-energy milling showed that the obtained specific capacity increased with particle size reduction as long as the crystallinity degree of the LTO material remained high. The Li-ion diffusion coefficient for each material was obtained, as well as its specific resistivity and the intrinsic rate constant for the