Synthesis of $Li_4Ti_5O_{12}$ and its electrochemical properties

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Lithium-ion batteries are now well established in the market as the rechargeable power source. The spinel $Li_4Ti_5O_{12}$ has many advantages over the graphite, although, which has been used as anode since lithium ion batteries was invented.

$Li_4Ti_5O_{12}$ shows negligible lattice change during the intercalation of Lithium ions. Therefore, the excellent cyclability can be expected for spinel $Li_4Ti_5O_{12}$ [1]. Another important advantage of $Li_4Ti_5O_{12}$ is safe for $Li_4Ti_5O_{12}$ spinel to be used in power batteries of large applications such as Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV).

The low intrinsic electronic conductivity is a present shortcoming of $Li_4Ti_5O_{12}$ material, which prevents its rate performances. Many synthesizing methods have been proposed to improve its electrochemical properties. Among of these methods, the solid state reaction is a commonly used method to prepare electrode materials for lithium ion batteries. It is simple and suitable for mass production. However, electrochemical performances of the $Li_4Ti_5O_{12}$ prepared by solid state method are usually not satisfactory. This is due to the inhomogeneity, large size and irregular morphology of products synthesized by solid state method [2].

We report the synthesized $Li_4Ti_5O_{12}$ with small and well-distributed particle size (~ 0.5 μm). The influences of reaction conditions such as reaction temperatures and reaction time on the products were investigated in detail.

References:

[1] T. Ohzuku, A. Ueda, J. Electrochem. Soc. 142 (1995) 1431.

[2] Y. Hao, Q. Lai, Z. Xu, X. Liu, X. Ji, Solid State Ionics 176 (2005) 1201.