Synthesis of Li$_4$Ti$_5$O$_{12}$ 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$_4$Ti$_5$O$_{12}$ has many advantages over the graphite, although, which has been used as anode since lithium ion batteries was invented.

Li$_4$Ti$_5$O$_{12}$ shows negligible lattice change during the intercalation of Lithium ions. Therefore, the excellent cyclability can be expected for spinel Li$_4$Ti$_5$O$_{12}$\(^1\). Another important advantage of Li$_4$Ti$_5$O$_{12}$ is safe for Li$_4$Ti$_5$O$_{12}$ 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$_4$Ti$_5$O$_{12}$ 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$_4$Ti$_5$O$_{12}$ 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$_4$Ti$_5$O$_{12}$ 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:
