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Electrochemical Characteristics of Carbon-Coated $Li_4Ti_5O_{12}$ by carbon source and structure for Hybrid Capacitor

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The Electrochemical hybrid capacitors can perform that need to high power operations and long cycle life. Beside with a high power capability and relatively large energy density compared to conventional capacitors. The hybrid capacitor utilizes the charge-transfer pseudocapacitance arising from reversible Faradic reactions. [1]

$Li_4Ti_5O_{12}$ has many advantages such as good reversibility of Li-ion insertion / extraction and near-zero structural change during charging and discharging. Despite many advantages associated with $Li_4Ti_5O_{12}$, its low electronic conductivity at room temperature ($<10^{-13}$ S cm^{-1}) results in initial capacity loss and poor rate capability. Several methods have been utilized to improve the electronic conductivity of $Li_4Ti_5O_{12}$ and positive results have been reported. [2]

Our strategy is synthesizing $Li_4Ti_5O_{12}$ coating with conductive carbon. Especially, it was expected to lead to adequate improvement of the electrical conductivity of $Li_4Ti_5O_{12}$. This aspect is attracted to use a carbon-coated $Li_4Ti_5O_{12}$ as negative electrode in non-aqueous hybrid supercapacitor. [3]

First, various carbon materials were used as coating sources for the carbon coating on the surface of $Li_4Ti_5O_{12}$, In addition, the high rate charge-discharge characteristics and cycle ability were conformed to apply that to hybrid capacitor by electrochemical analyzing carbon sources

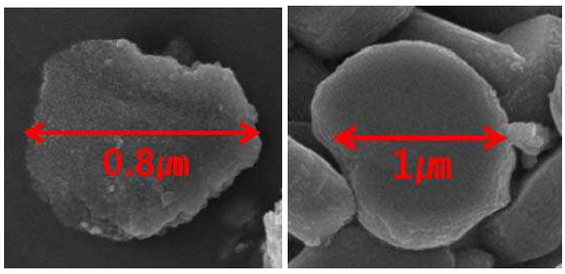

Fig 1 Scanning electron microscope images of $Li_4Ti_5O_{12}$ and carbon coated $Li_4Ti_5O_{12}$ from styrene.

In this study, Carbon-coated $Li_4Ti_5O_{12}$ was synthesized by sol-gel method using lithium hydroxide (LiOH) and tetratitanium iso-propoxide(TTIP), and various organic composite. We have researched the developed electrochemical characteristics of carbon-coated $Li_4Ti_5O_{12}$ spherical particles. Carbon-coated $Li_4Ti_5O_{12}$ was analyzed by scanning electron microscopy and X-ray diffraction. The carbon content was measured by elemental analysis and thermogravimetric analysis. The direct current electrical conductivity was measured using a direct voltametry method. The electrochemical analyses were accomplished to asymmetric hybrid capacitor.

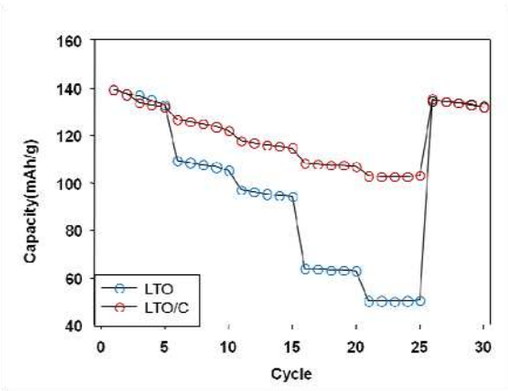

Fig 2 Discharge capacity by current density of LTO and LTO-C composite from styrene in LiBF4/PC

Reference

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