A High Capacity $Li_4Ti_5O_{12}$/Si Composite as Anode Material for Lithium-Ion Batteries Prepared by Spray-Pyrolysis

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The modern society dictates the high demand for advanced energy storage systems with high capacity and durability. Therefore, the development of the next generation Li-ion batteries (LIBs), which meets the power and energy requirements for new applications, demands the introduction of innovative anode materials. Silicon has the highest possible capacity of 4200 mAh g^{-1} among all commonly used anodes [1]. However, its main drawback is mechanical degradation upon cycling due to a huge volume expansion up to 400% during lithiation process [2]. Due to its 'zero-strain' (<1% volume change) properties and stable cycling, $Li_4Ti_5O_{12}$ (LTO) is considered as a promising anode for LIBs. However, LTO has low capacity. Combination of these two anode materials is considered as a promising approach to prepare a high performance composite cathode.

In this study, $Li_4Ti_5O_{12}$/Si composite was prepared by spray-pyrolysis (SP) under various preparation conditions. The obtained composite particles are spherical and have narrow particle size distribution. The particle sizes of the particles could be controlled by variation of the precursor solution concentration. The presence of $Li_4Ti_5O_{12}$ and Si in the obtained composite was confirmed by X-ray diffraction technique (XRD). The influence of $Li_4Ti_5O_{12}$ and Si weight ratios along with the preparation conditions (temperature, carrier gas flow rate) on the electrochemical properties of the battery was investigated. The details of these studies will be presented at the Conference.

Acknowledgments

This work was supported by the project No.AP05133706 "Advanced high capacity anode for new generation batteries based on lithium titanate" by the Ministry of Education and Science of the Republic of Kazakhstan.

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