Short Communication

Microwave-Assisted Sol-Gel Modification of Al- or C-doped $\text{Li}_4\text{Ti}_5\text{O}_{12}$ Samples as Anode Materials for Li-ion Batteries

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Pure $\text{Li}_4\text{Ti}_5\text{O}_{12}$ and Al- or C-doped $\text{Li}_4\text{Ti}_5\text{O}_{12}$ samples were synthesized by a microwave-assisted sol-gel method. The structural characterization was performed by X-ray diffraction. The surface morphology was analyzed by scanning electron microscopy. The electrochemical properties were studied by galvanostatic charge and discharge measurements. The results show that after a microwave treatment at 800 °C for 4 h, the size of the particles was 60–70 nm. The crystal structure of $\text{Li}_4\text{Ti}_5\text{O}_{12}$ was unchanged and the Ti atom position in the sample was replaced by Al or C, and the dispersion of the doped samples was better than the original sample, which is beneficial for the intercalation and deintercalation of Li^+ . The measured electrochemical properties indicated that the discharge capacity of the all samples was stable, with the first discharge capacity of the Al- and C-doped sample higher than the original sample. The first discharge capacity of $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{C}$ was 162 mAh/g, which was closer to the theoretical capacity of $\text{Li}_4\text{Ti}_5\text{O}_{12}$ (175 mAh/g). After 40 cycle life tests, the discharge capacity could be maintained at 136 mAh/g. The discharge rate capability tests showed that the reversible capacity of $\text{Li}_4\text{Ti}_5\text{O}_{12}/\text{C}$ is restored to 150 mAh/g, with a current density loss of 12 mAh/g compared to the initial discharge capacity, indicating its better structural stability.

Keywords: $\text{Li}_4\text{Ti}_5\text{O}_{12}$; sol-gel method; microwave heating; electrochemical property

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