Short Communication

Preparation of new composite electrolytes for solid-state lithium rechargeable batteries by compounding LiTFSI , PVDF-HFP and LLZTO

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The addition of $\text{Li}_7\text{La}_3\text{Zr}_{1.4}\text{Ta}_{0.6}\text{O}_{12}$ (LLZTO) particles to polymer electrolytes can reduce the crystallinity of polymer materials, promote the migration of lithium ions, and then improve the ionic conductivity of polymer solid electrolytes. Oxide-polymer composite solid electrolytes with different contents of LLZTO were prepared from Lithium bis(trifluoromethylsulphonyl)imide (LiTFSI), polyvinylidene fluoride-hexafluoropropylene (PVDF-HFP) and LLZTO powder as raw materials. The study has found that the solid electrolyte with 15 wt% LLZTO has higher ionic conductivity and mechanical strength, and has a wider electrochemical window (5.5V). The prepared composite cathode electrode/solid electrolyte/composite anode electrode solid-state lithium ion battery has a charge-discharge specific capacity of 179.56 mAh/g and 146.73 mAh/g for the first cycle, the coulombic efficiency is of 84%, and the discharge capacity retention rate after 30 cycles is above 94%. In addition, the change of impedance before and after the cycle is small, showing good interface stability.

Keywords: Solid-state lithium battery, Composite solid electrolyte, LLZTO, LiTFSI, PVDF-HFP

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