TiO₂@C@MoS₂ Spheres as Efficient Sulfur Host for Lithium–Sulfur Batteries

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In this paper, TiO₂ @ C @ MoS₂ composite has been successfully synthesized by wrapping TiO₂ spheres with C layer and MoS₂ nanosheets. Firstly, TiO₂ spheres are synthesized by solvothermal and subsequent calcination process; subsequently, TiO₂ spheres are coated with dopamine and carbonized to form TiO₂@C spheres; then, ultrathin MoS₂ nanosheets grew outside the TiO₂@C spheres; finally, sulfur infiltrated into the TiO₂@C@MoS₂ spheres by melt diffusion method and the TiO₂@C@MoS₂/S spheres were successfully synthesized for the sulfur main body of lithium-sulfur batteries. The composite material has strong binding for polysulfides and good adsorption and catalysis, so it is an ideal carrier for sulfur host materials. By using such a composite material as a positive electrode in a Li-S battery, better electrochemical performance has been achieved. The results show that, the sulfur loading is about 63%, and the specific capacity of the sulfur positive electrode reaches 535.9 mAh g⁻¹ after 99 cycles at 0.1 C current density, and the specific capacity reaches 392.4 mAh g⁻¹ after 100 cycles at 0.5 C current density. The capacity retention rate is about 76.28%.

Keywords: Lithium-sulfur battery, Composite material, TiO₂, C, MoS₂

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