SnO₂/TiO₂ Nanocomposite Prepared by Pulsed Laser Deposition as Anode Material for Flexible Quasi-solid-state Lithium-Ion Batteries

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doi: 10.20964/2020.12.49

Received: 23 August 2020 / Accepted: 14 October 2020 / Published: 31 October 2020

SnO₂/TiO₂ nanoparticle structure were prepared by alternately depositing SnO₂ and TiO₂ by pulsed laser deposition (PLD) system as the anode of lithium-ion batteries. The prepared SnO₂/TiO₂ electrode material has a high reversible capacity (809.30 mAh g⁻¹ capacity after cyclic testing for 100 times at a current density of 100 mA g⁻¹) and a high rate capability (488.71 mAh g⁻¹ capacity at a current density of 3000 mA g⁻¹). The nanoparticle membrane structure significantly shortens the diffusion distance of lithium ions and effectively buffers the stress generated in the process of cyclic charging and discharging. Moreover, the two oxide particles, SnO₂ and TiO₂, are distributed at intervals throughout the electrode, which greatly limits the position migration of nanoparticles in the circulation process, thereby it significantly enhances the integrity and stability of the electrode structure in the circulation process. Besides, the SnO₂/TiO₂ film with nanoparticle structure was successfully applied to the flexible quasi-solid-state batteries, which can easily light up the blue high-power LED in different bending states. These excellent electrochemical properties confirm the importance of our work for providing a new strategy to produce anode materials for lithium-ion batteries. Our work may shed light on the design of anode materials in high-performance lithium-ion batteries, exceptionally thin-film micro batteries and flexible lithium-ion batteries.

Keywords: nanoparticle structure; pulsed laser deposition; high reversible capacity; high rate capability; flexible quasi-solid-state batteries

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