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In-situ growth of 1T/2H-MoS₂ on carbon fiber cloth and the modification of SnS₂ nanoparticles: A three-dimensional heterostructure for high-performance flexible lithium-ion batteries

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Abstract

Flexible lithium ion batteries are important for wearable electronic devices. Herein, 1T/2H phase MoS₂ nanosheets are grown on carbon fiber cloth, and the ultra-small SnS₂ nanoparticles are anchored in the surface of MoS₂ nanosheets uniformly. We fabricate the hierarchical nanostructures via a hydrothermal method then water bath process. During in-situ growth of 1T/2H phase MoS₂, urea is used as the surfactant and NH⁴⁺ (produced by urea and ammonium molybdate tetrahydrate) is acted as insertion guest ions to stabilize 1T phase MoS₂. The synergistic effects between MoS₂ nanosheets and SnS₂ nanoparticles can improve structural stability of the electrode and significant enhance the transport of Li ions and electrons, thereby ameliorate the electrochemical properties. When applied as a binder-free, flexible Li-ion battery anode, it exhibits admirable cycling stability and excellent rate performance. Due to the presence of 1T phase MoS₂ and evenly distributed of ultra-small SnS₂ nanoparticles on MoS₂ nanosheets, the SnS₂/MoS₂/carbon fiber cloth composites maintain 1294 mA h g⁻¹ when

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