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A flexible 3D graphene@CNT@MoS_2 hybrid foam anode for high-performance lithium-ion battery

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Abstract

A three-dimensional (3D) flexible hybrid foam composed of graphene foam@carbon nanotubes decorated with MoS_2 nanoparticles is synthesized for flexible anode applications in lithium-ion battery. The inner layer of graphene foam (GF), serving as a 3D skeleton of the hybrid foam, which enlarges the electrode/electrolyte contact, shortens the diffusion distance of Li^+ ions and provides enough internal void space to accommodate the large volume change of MoS_2 nanoparticles. The middle carbon nanotubes (CNT) layer wrapped on the graphene foam is more conductive to facilitate electron/ion transport within the hybrid foam and can further enhance the flexibility of the hybrid foam. The outer layer of active MoS_2 nanoparticles can provide high specific capacity. Owing to these advantages, the flexible GF@CNT@MoS_2 electrodes delivers a specific capacity of 935 mAh g^{-1} at a current density of 0.1 A g^{-1}, high reversible capacity of 606 mAh g^{-1} after 200 cycles at 0.2 A g^{-1}.

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