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Porous three-dimensional reduced graphene oxide for high-performance lithium-sulfur batteries

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Abstract

Porous three-dimensional reduced graphene oxide (3D-RGO) was successfully synthesized. After being loaded with sulfur, the as-obtained 3D-S-RGO composite was used as a cathode for Li-S batteries. Due to its unique 3D-structured porous carbon layers with a high surface area, a high sulfur loading (75.8%) was achieved. More importantly, its 3D structure can also serve as a polysulfide storeroom to relieve the shuttle effect. Therefore, compared with regular sulfur-loaded reduced graphene oxide (S-RGO), the 3D-S-RGO cathode exhibits a greatly improved discharge capacity and cycling stability. The 3D-S-RGO cathode delivers an initial discharge capacity of 1140 mAh g^{-1} at 0.2 C and remains at 790 mAh g^{-1} after 200 cycles. This study shows that the 3D structure is essential for improving the performance of graphene-based cathodes in Li-S batteries.

Keywords: Electrode materials; Energy storage materials; Electrochemical reactions; Electrochemical impedance spectroscopy

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