Flexible free-standing hollow Fe_3O_4/graphene hybrid films for lithium-ion batteries

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Abstract

Flexible free-standing hollow Fe_3O_4/graphene (H- Fe_3O_4/GS) films were fabricated through vacuum filtration and thermal reduction process, in which graphene formed a three-dimensional conductive network, with hollow and porous Fe_3O_4 spindles being captured and distributed homogeneously. Using the films as binder-free and free-standing electrode for lithium-ion batteries, H- Fe_3O_4/GS with 39.6 wt% graphene exhibited a high specific capacity (1555 mAh g-1 at 100 mA g-1), enhanced rate capability and excellent cyclic stability (940 and 660 mAh g-1 at 200 and 500 mA g-1 after 50 cycles, respectively). The superior electrochemical performance of this novel material can be attributed to two reasons. One is three dimensional (3D) graphene network formed is very helpful to keep H- Fe_3O_4 in good electric contact. Another is the short transport length for both lithium ions and electrons, porous nature to accommodate volume change and favor electrolyte penetration. It is believed that the strategy for preparing free-standing H- Fe_3O_4/GS papers presented in the work will provide new insight into the design and synthesis of other metal oxide/GS electrodes for flexible energy storage devices.

References

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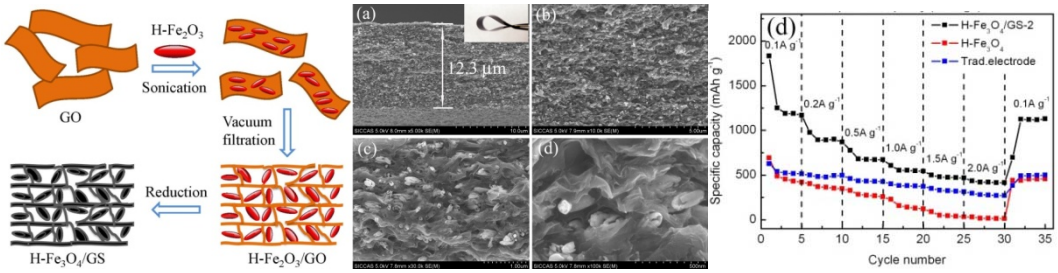
Figures



Synthesis of Fe_3O_4/graphene and their electrochemical properties