Reduced Graphene Oxide Wrapped Sulfur/Polypyrrole Composite Cathode with Enhanced Cycling and Rate Performance for Lithium/Sulfur Batteries

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An innovative reduced graphene oxide wrapped sulfur/polypyrrole (S/PPy@RGO) composite is synthesized via a one-pot polymerization of pyrrole monomer in a sulfur/reduced graphene oxide aqueous suspension. This one-pot preparation method is efficient through its inherent simplicity and low cost. The resultant S/PPy@RGO composite was characterized via EDS, XRD, SEM, TEM and electrochemical measurements. In the S/PPy@RGO ternary composite, reduced graphene oxide played a crucial role of coating a thin layer to trap soluble polysulfide intermediates, provide a continuous electrically conducting network and accommodate volume expansion. Meanwhile polypyrrole with its high absorptivity, joins sulfur and RGO as a binding agent, and tether polysulfides into its porous framework. Therefore, the synthesized S/PPy@RGO composite delivers excellent rate ability and highly cycling stability. This composite can retain a specific discharge capacity of 615.3 mAh g⁻¹ at 0.2C, even after 100 cycles.

Keywords: S/PPy@RGO composite; one pot polymerization; lithium/sulfur batteries; electrochemical performance

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