Garlic peel derived mesoporous carbon for high-performance lithium-sulfur batteries

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Recently, extensive researches for composite technologies of sulfur and carbon matrices such as carbon nano-tube, graphene and activated carbon have been carried out due to their excellences as accessibility, producibility, electrochemical inertness and wide temperature range.[1] Additional, several researches have shown that doped carbon materials with heteroatoms such as nitrogen, sulfur, boron and phosphorous is a promising approach to further improve the electric conductivity and electrochemical activity.[2,3] Herein, we have chosen garlic peel as an easily available agricultural waste for synthesising S-doped porous carbon. The garlic peel carbon-sulfur (GPC/HT-S) synthesized by a hydrothermal method has been employed as a cathode material for a lithium-sulfur batteries. The synthesized carbon material has been found to be mesoporous with a large specific surface area (2470 m^2 g^{-1}) and a high inner pore volume (1.11 cm^3 g^{-1}) as calculated with Brunauer-Emmett-Teller isotherm. When evaluating its electrochemical properties, the GPC/HT-S composite with ~80 wt % sulfur content displays an excellent cycle performance. The specific discharge capacity still reaches 667 mAh g^{-1} after 200 cycles at 0.5C. At a higher rate of 1C, the capacity stabilized at 472 mAh g^{-1} after 200 cycles. This work not only provides a new carbon material for use in high performance lithium-sulfur batteries, but also presents an effective strategy to simultaneously tune the structure and surface chemistry of carbon materials.

References:

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