Pitaya-Like Sulfur Electrodes by Chemically Anchored Polyaniline Shell for Lithium–Sulfur Batteries

Yan Wang^{1,*}, Wenxuan Wang²

¹ School of Information and Electronic Engineering, Hunan University of Science and Technology, Hunan 411201, China

² School of Materials Science and Engineering, Xiangtan University, Hunan 411105, China

*E-mail: ywang8@hnust.edu.cn

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Lithium–sulfur batteries are an attractive technology due to the light weight and low cost of sulfur, and a high theoretical specific capacity and specific energy compared to current lithium-ion batteries. However, a rapid capacity fade may occur which can be attributed mainly to polysulfide dissolution and volume expansion. To trap the polysulfides in the electrode of lithium–sulfur batteries and improve the electrochemical performances, we prepared a core–shell structure of polymer-coated sulfur cathode. By a simple two-step liquid phase reaction, a core-shell structural pitaya-like S/SiO₂@polyaniline (SSP) was first reported, which is expected to be catalytic for chemical reactions and able to adsorb lithium polysulphides. The results show that the SSP composites exhibited a high specific capacity and good cycling stability due to the role of complementary advantages of both polyaniline shell and SiO₂ particles for lithium–sulfur batteries. The SSP cathode delivered an initial specific discharge capacity of 850 mA h g^{−1} and maintained 500 mA h g^{−1} after 230 cycles at 0.5 C. The improvements of electrochemical performances may be attributed to the unique hybrid nanostructure of SSP and good dispersion of SiO₂ particles in sulfur.

Keywords: Polyaniline; Core–shell; Cathodes; Lithium–sulfur batteries

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