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Nitrogen-Doped Activated Microporous Carbon Spheres as a Sulfur Matrix for Advanced Lithium-Sulfur Batteries

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Abstract

A kind of nitrogen-doped activated microporous carbon sphere/sulfur composite (NAMCS/S) is deliberately designed and prepared via a controllable solvothermal method and a liquid phase in-situ sulfur deposition technology. The structure characteristic and composition analysis of samples are conducted with X-ray photoelectron spectroscopy (XPS), elemental analysis (EA), field-emission scanning electron microscopy (FESEM) and high resolution transmission electron microscope (HRTEM). The electrochemical performances are characterized by galvanostatic charge-discharge (GCD), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) measurements. The results show that the nitrogen-doped activated microporous carbon spheres (NAMCS) present uniform spherical morphology, abundant nitrogen content of 9.64 wt%, and large specific surface areas of 1578.6 m^2/g. Compared with the activated microporous carbon sphere/sulfur (AMCS/S) composite, the NAMCS/S composite with same sulfur loading of 64 wt% can deliver a higher initial capacity of 1004.6 mAh/g and a stable capacity retention of 79.1 % after 100 cycles at 0.1 C rate as well as a remarkable Coulombic efficiency of 93 %