Zinc acetate activation-enhanced performance of hollow nano silica/carbon composite nanofibers for lithium-sulfur batteries

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Zinc acetate activation-enhanced performance of hollow nano silica/carbon composite nanofibers for lithium-sulfur batteries

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Abstract

Here we develop a facile and scalable method to prepare silica/activated carbon nanofibers (SiO_2/ACNFs) via electrospinning a mixture of PAN and hollow SiO_2 nanospheres with following heat treatment, during which $Zn(CH_3COO)_2$ activation and PAN carbonization are simultaneously completed. When applied in lithium sulfur battery, the coin cells using S/SiO_2/ACNF composites as cathode material exhibit a high discharge specific capacity and long cycling life. The specific capacity at 0.5 and 1 C rates after 300 cycles still remains at 584 and 513 mAh g^{-1}, respectively, and the corresponding capacity decay is just 0.09% at 0.5 C and 0.13% at 1 C per cycle. The $Zn(CH_3COO)_2$ activation benefits sulfur loading and volume expansion suppression by creating numerous hierarchical pores in carbon nanofibers. Additionally, hollow SiO_2 nanospheres contribute to restrain the "shuttle effects" by adsorbing and releasing polysulfides reversibly. This kind of SiO_2/ACNF material and its fabrication method hold high potential for Li-S battery.

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