Enhanced lithium-sulfur battery performance by mesoporous-hollow carbon from using milkweed fiber

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For the last 20 years, there has been a strong incentive to develop a rechargeable lithium sulfur (Li-S) battery. Because sulfur has high theoretical capacity of 1675 mAh g^{-1} and energy density of 2600 Wh Kg^{-1}.[1] There are some issues for practical application of the Li-S batteries such as low electrical conductivity, dissolution of lithium polysulfide intermediates in organic electrolyte and volume expansion.[2.3] In this study, to overcome these obstacles, the hollow carbon nanoscrap (HCNS) was synthesized by carbonizing and activating using the milkweed fiber. And then, dissolved sulfur in CS_2 solvent is embedded in HCNS to synthesize the S-HCNS composite. The HCNS carbon template with a large surface area (1756.92 m^2 g^{-1}) is beneficial to both trapping soluble polysulfide intermediates and rendering the electrical conductivity of the prepared electrode. The S-HCNSs are prepared with different sulfur contents (62, 80 and 94 wt.%) and the S-HCNS with 80 wt.% of sulfur content (8S-HCNS) displays an excellent cycle performance. The resulting 8S-HCNS composite exhibits a stable specific capacity of 557 mAh g^{-1} after 200cycles at a current density of 0.5C. In the case of the 9S-HCNS with high sulfur content, the capacity is significant increased from 463 mAh g^{-1} to 743 mAh g^{-1} after 200 cycles when coupled with a carbon-coated separator. This experiement results provides new carbon materials from biomass for practical application in Li-S batteries.

References:

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