The Straw Carbon Material as the Cathode Material for Lithium-Sulfur Batteries

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Lithium/sulfur (Li-S) battery is a promising electrochemical system for the next generation of high density rechargeable battery, boasting a theoretical capacity of 1675 mAh/g. Regarding the increasingly straw-related problems, I employed a low-cost and eco-friendly carbon-straw charcoal and a facile producing technique to prepare the cathode material for Li-S batteries in this project. Firstly, the straw was calcinated under N2 atmosphere at 900 °C for 2 hours with a heating rate of 5 °C /min in a box-type furnace. Secondly, after the intermediate product was mixed with different amounts of KOH (C:KOH at the proportion of 1:1, 1:2, 1:3), I calcinated it again and washed it with acid and distilled water to eventually yield the straw charcoal with hierarchical pore sizes. The S/C composite was prepared by vacuum adsorption. At last, the composite was heated again at 280 °C to remove the sulfur which was loaded on the surface of the carbon. The activated carbon material (1:3, mass ratio C:KOH) have the largest specific surface area and pore volume. And the electrochemical performance was confirmed because the battery with the composite showed the reversible capacity remaining high up to 774 mAh/g even after 25 cycles at a rate of 0.1 C (1 C=1675mA/g). Based on the electrochemistry investigations, the porous carbon could prevent the polysulfide from dissolving into the electrolyte. Therefore, the structural integrity of cathode could be definitely retained during the cycling, which finally results in the high cycling performance.

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