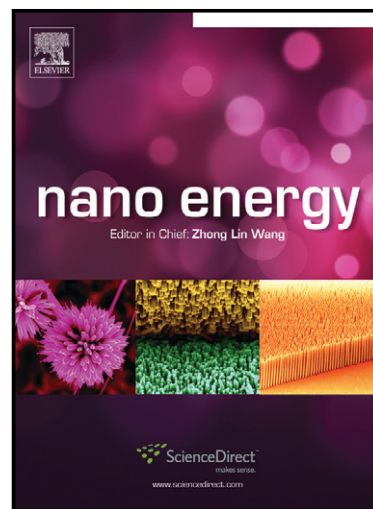


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Molecular-Confinement of Polysulfide within Mesoscale Electrodes for Practical Application of Lithium Sulfur Batteries

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Abstract

Nitrogen-doped porous carbon (NPC) and multi-wall carbon nanotube (MWCNT) have been frequently studied to immobilize sulfur in lithium-sulfur (Li-S) batteries. However, neither NPC nor MWCNT itself can effectively confine the soluble polysulfides if cathode thickness e.g. sulfur loading is increased. In this work, NPC was combined with MWCNT to construct an integrated host structure to immobilize sulfur at a relevant scale. The function of doped nitrogen atoms was revisited and found to effectively attract sulfur radicals generated during the electrochemical process. The addition of MWCNT facilitated the uniform coating of sulfur nanocomposites to a practically usable thickness and homogenized the distribution of sulfur particles in the pristine electrodes, while NPC provided sufficient pore volume to trap dissolved species. More importantly, the wetting issue, the critical challenge for thick sulfur cathodes, is also mitigated after the adoption of MWCNT, leading to a high areal capacity of ca. 2.5 mAh/cm² with capacity retention of 81.6% over 100 cycles.

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