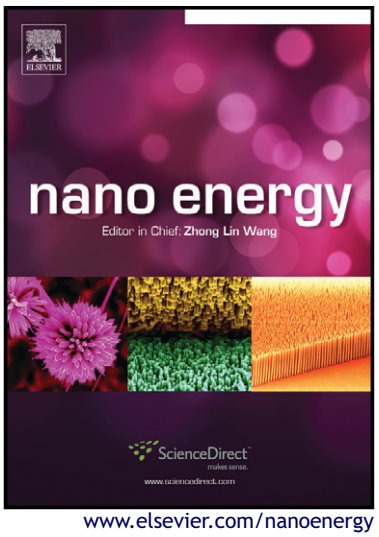

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Molecular-Confinement of Polysulfide within Mesoscale Electrodes for Practical Application of Lithium Sulfur Batteries

Junzheng Chen, Dangxin Wu, Eric Walter, Mark Engelhard, Priyanka Bhattacharya, Huilin Pan, Yuyan Shao, Fei Gao, Jie Xiao, Jun Liu*

Joint Center for Energy Storage Research, Pacific Northwest National Laboratory, Richland, WA 99354, USA

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 polysufides 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/cm^2 with capacity retention of 81.6% over 100 cycles.

* Corresponding authors.
E-Mail: Jun.liu@pnnl.gov (J. Liu)
Tel: +1 (509) 375-4443