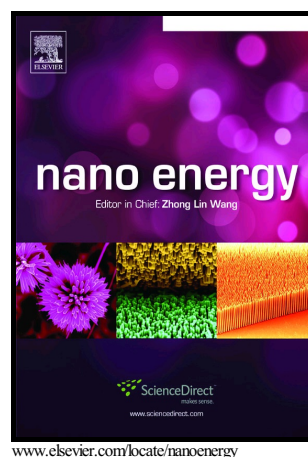


High Coulombic Efficiency and High-Rate Capability Lithium Sulfur Batteries with Low-Solubility Lithium Polysulfides by Using Alkylene Radicals to Covalently Connect Sulfur

Xuejun Liu, Na Xu, Tao Qian, Jie Liu, Xiaowei Shen, Chenglin Yan



PII: S2211-2855(17)30636-5
DOI: <https://doi.org/10.1016/j.nanoen.2017.10.032>
Reference: NANOEN2266

To appear in: *Nano Energy*

Received date: 21 June 2017
Revised date: 1 August 2017
Accepted date: 12 October 2017

Cite this article as: Xuejun Liu, Na Xu, Tao Qian, Jie Liu, Xiaowei Shen and Chenglin Yan, High Coulombic Efficiency and High-Rate Capability Lithium Sulfur Batteries with Low-Solubility Lithium Polysulfides by Using Alkylene Radicals to Covalently Connect Sulfur, *Nano Energy*, <https://doi.org/10.1016/j.nanoen.2017.10.032>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

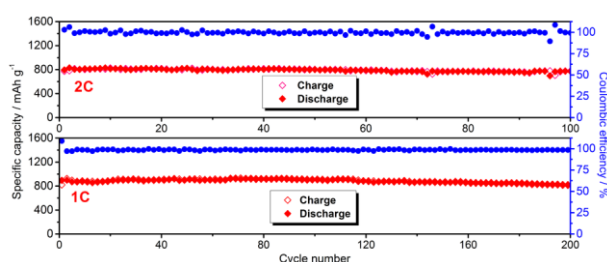
High Coulombic Efficiency and High-Rate Capability Lithium Sulfur Batteries with Low-Solubility Lithium Polysulfides by Using Alkylene Radicals to Covalently Connect Sulfur

Xuejun Liu, Na Xu, Tao Qian,* Jie Liu, Xiaowei Shen, and Chenglin Yan*

College of Physics, Optoelectronics and Energy & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou 215006, China.
E-mail: tqian@suda.edu.cn (T. Qian); c.yan@suda.edu.cn (C. Yan)

Abstract: The long-chain lithium polysulfides that are soluble in ether-based electrolyte for lithium sulfur battery are regarded as one of reason for their low Coulombic efficiency and low rate capability. In this work, we reported a new strategy to stabilize sulfur cathodes with alkylene radicals to covalently connect sulfur through the formation of low-solubility lithium polysulfides, which enables high Coulombic efficiencies of 99.9% at 0.2 C, 99.9% at 0.5 C, 100% at 1 C, 100% at 2 C, 100% at 4 C, 100% at 6 C as well as outstanding rate capability with a high capacity of 702 mAh g⁻¹ at 6 C. The proposed mechanism was clearly revealed by *in-situ* UV/Vis spectroscopy, demonstrating that short chain polysulfides as discharge products with low solubility are mainly produced during charging and discharging process. Moreover, DFT calculations confirmed that the bond breakage of the linear sulfur chains preferentially takes place in the center of the linear polysulfane, resulting in the formation of short-chain polysulfides, which could effectively avoid the production of soluble long-chain polysulfide and suppress the shuttling effect for high Coulombic efficiency and high-rate capability lithium sulfur batteries.

Graphical abstract



A new strategy is reported to stabilize sulfur cathodes with alkylene radicals through the formation of weakly soluble lithium polysulfides, which enables nearly 100% Coulombic

Download English Version:

<https://daneshyari.com/en/article/7953118>

Download Persian Version:

<https://daneshyari.com/article/7953118>

[Daneshyari.com](https://daneshyari.com)