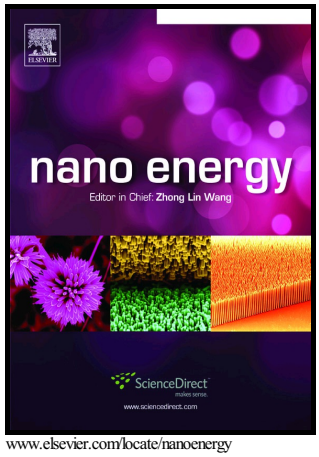

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PII: S2211-2855(18)30718-3
DOI: https://doi.org/10.1016/j.nanoen.2018.09.065
Reference: NANOEN3071

To appear in: *Nano Energy*

Received date: 10 August 2018
Revised date: 26 September 2018
Accepted date: 30 September 2018

Cite this article as: Susanne Doerfler, Patrick Strubel, Tony Jaumann, Erik Troschke, Felix Hippauf, Christian Kensy, Alexander Schökel, Holger Althues, Lars Giebeler, Steffen Oswald and Stefan Kaskel, On The Mechanistic Role of Nitrogen-Doped Carbon Cathodes in Lithium-Sulfur Batteries with Low Electrolyte Weight Portion, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.09.065

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Declarations of interest: none

Abstract

The lithium-sulfur (Li–S) battery is a promising alternative to overcome capacity and specific energy limitations of common lithium-ion batteries. Highly porous, nitrogen-doped carbons as conductive host structures for sulfur/lithium sulfide deposition are shown herein to play a critical role in reversible cycling at low electrolyte/sulfur ratio. The pore geometry is precisely controlled by an efficient, scalable ZnO hard templating process. By using an electrolyte volume as low as 4 µl mg^{-1}_S, the beneficial nitrogen functionality leads to a twofold increased cell lifetime turning our findings highly favorable for real applications. Stable cycling of up to 156 cycles (59 cycles with undoped carbon) with high sulfur loadings of 3 mg cm^{-2} is achieved. *Operando* X-ray diffraction measurements during cycling show the transformation pathway of the sulfur – polysulfide – Li_2S species. The observed intermediates critically depend on the nitrogen doping in the cathode carbon matrix. Nitrogen-doped carbons