Accepted Manuscript

Multi-functional CoS_2-N-C porous carbon composite derived from metal-organic frameworks for high performance lithium-sulfur batteries

Shiqiang Luo, Chunman Zheng, Weiwei Sun, Yiqi Wang, Jianhuang Ke, QingPeng Guo, Shuangke Liu, Xiaobin Hong, Yujie Li, Wei Xie

PII: S0013-4686(18)32020-6

DOI: 10.1016/j.electacta.2018.09.048

Reference: EA 32561

To appear in: *Electrochimica Acta*

Received Date: 23 June 2018

Revised Date: 4 September 2018

Accepted Date: 5 September 2018

Please cite this article as: S. Luo, C. Zheng, W. Sun, Y. Wang, J. Ke, Q. Guo, S. Liu, X. Hong, Y. Li, W. Xie, Multi-functional CoS_2-N-C porous carbon composite derived from metal-organic frameworks for high performance lithium-sulfur batteries, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.09.048.

Multi-functional CoS_2-N-C Porous Carbon Composite Derived from Metal-Organic Frameworks for High Performance Lithium-Sulfur Batteries

Shiqiang Luo[1], Chunman Zheng[1,*], Weiwei Sun, Yiqi Wang, Jianhuang Ke, QingPeng Guo, Shuangke Liu, Xiaobin Hong, Yujie Li, Wei Xie[*]

(College of Aerospace Science and Engineering, National University of Defense Technology, Hunan Changsha 410073, China)

Abstract

Lithium-sulfur (Li-S) battery is recognized as one of the most promising high-energy-density storage system. However, the poor cycle life and low sulfur utilization originating from the shuttling process involving lithium polysulfide (LiPSs) significantly hinder the practical application of Li-S battery. Various approaches have been introduced to retard the shuttle of LiPSs. Herein, a polar cobalt disulfide embedded in porous nitrogen doped carbon frameworks (CoS_2-N-C) is synthesized from a single metal-organic framework ZIF-67. When used as a sulfur host for Li-S battery cathode, the CoS_2-N-C frameworks can not only limit the dissolution of LiPSs by chemisorption, but also buffer the volume expansion during cycling. More importantly, the electrochemical reaction kinetics is greatly improved. As a result, the Li-S battery based on the S/CoS_2-N-C electrode exhibits a high initial discharge capacity of 1288 mAh g^{-1} at 0.2 C and a superior long cycle life for 500 cycles with a

1 These authors contributed equally to this work and should be considered co-first authors

* Corresponding author 1. Tel.: +8613975146446. E-mail address: zhengchunman@nudt.edu.cn

* Corresponding author 2. Tel.: +8618569548702. E-mail address: xiew014@mail.ustc.edu.cn