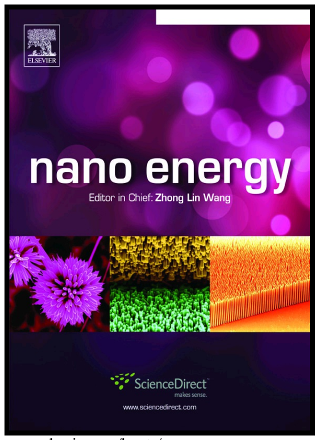

www.elsevier.com/locate/nanoenergy

Direct Insights into the Electrochemical Processes at Anode/Electrolyte Interfaces in Magnesium-Sulfur Batteries

Xin-Cheng Hu, Yang Shi, Shuang-Yan Lang, Xing Zhang, Lin Gu, Yu-Guo Guo, Rui Wen, Li-Jun Wan

PII: S2211-2855(18)30295-7
DOI: https://doi.org/10.1016/j.nanoen.2018.04.066
Reference: NANOEN2696

To appear in: *Nano Energy*

Received date: 16 March 2018
Revised date: 12 April 2018
Accepted date: 24 April 2018

Cite this article as: Xin-Cheng Hu, Yang Shi, Shuang-Yan Lang, Xing Zhang, Lin Gu, Yu-Guo Guo, Rui Wen and Li-Jun Wan, Direct Insights into the Electrochemical Processes at Anode/Electrolyte Interfaces in Magnesium-Sulfur Batteries, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.04.066

Direct Insights into the Electrochemical Processes at Anode/Electrolyte Interfaces in Magnesium-Sulfur Batteries

Xin-Cheng Hu [a,b], Yang Shi [a,b], Shuang-Yan Lang [a,b], Xing Zhang [a,b], Lin Gu [c], Yu-Guo Guo [a,b], Rui Wen[a,b,*], and Li-Jun Wan [a,b]

[a] *Key Laboratory of Molecular Nanostructure and Nanotechnology and Beijing National Laboratory for Molecular Science, CAS Research/Education Center for Excellence in Molecular Sciences, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China*

[b] *University of the Chinese Academy of Sciences, Beijing 100049, China*

[c] *Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China*

*Corresponding authors. E-mail address: ruiwen@iccas.ac.cn (R. Wen); postal address: No.2, 1st North Street, Zhongguancun, Beijing, P.R. China.

Abstract

Magnesium-sulfur (Mg-S) batteries are highly attractive because of their high theoretical energy density, low cost and safety features. However, severe capacity fading issues limit their development, which are greatly associated with reaction processes at electrode/electrolyte interfaces. Herein, we systematically studied the interfacial processes of Mg deposition/stripping in ether-based electrolytes at nanoscale by *in situ* atomic force microscopy (AFM). It can be directly observed the initial nucleation of bowl-like structure and deposition of crystallized Mg upon charge in tetraglyme (TEG) - based electrolyte, followed with uniform stripping process upon discharge. In contrast, the initial nucleation of bowl-like structure, fast stack of nanoparticles (NPs) and deposition of crystallized Mg upon charge can be observed in diglyme (DEG) - based electrolyte, followed with nonuniform stripping process upon discharge. Combined with *in situ* optical imaging, former system shows better reversibility upon cycle.