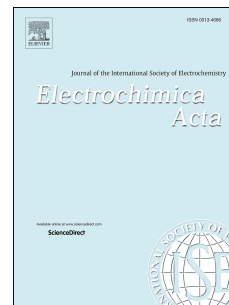


# Accepted Manuscript

Electrochemically controllable coating of functional silicon film on carbon materials

Hongwei Xie, Haijia Zhao, Jinyun Liao, Huayi Yin, Allen J. Bard



PII: S0013-4686(18)30490-0

DOI: [10.1016/j.electacta.2018.03.002](https://doi.org/10.1016/j.electacta.2018.03.002)

Reference: EA 31368

To appear in: *Electrochimica Acta*

Received Date: 27 December 2017

Revised Date: 1 March 2018

Accepted Date: 1 March 2018

Please cite this article as: H. Xie, H. Zhao, J. Liao, H. Yin, A.J. Bard, Electrochemically controllable coating of functional silicon film on carbon materials, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.03.002.

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 proof before it is published in its final 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.

1 Electrochemically controllable coating of functional silicon film on carbon  
2 materials

3 *Hongwei Xie<sup>1</sup>, Haijia Zhao<sup>1</sup>, Jinyun Liao<sup>2</sup>, Huayi Yin<sup>1\*</sup>, Allen J Bard<sup>2</sup>*

4 *1. School of Metallurgy, Northeastern University, Shenyang, P.R. China, 110819*

5 *2. Center for Electrochemistry, Department of Chemistry and Biochemistry, The University of Texas at  
6 Austin, TX, USA, 78712*

7 *Email: yinhy@smm.neu.edu.cn*

8 **Abstract:** A silicon deposit of various forms was successfully coated on graphite by  
9 electrodeposition in molten CaCl<sub>2</sub> containing nano-SiO<sub>2</sub> as a silicon precursor. The morphologies  
10 of the deposited silicon can be tuned from Si nanowires to a dense film by controlling constant  
11 electrolysis cell voltage. In addition to controlling electrochemical polarizations, the substrate  
12 plays a key role in forming a dense silicon film. By analyzing the interface between the Si film  
13 and graphite substrate, a thin transition layer comprising of Si, SiC and C enables the good  
14 adhesion of the Si film with the carbon substrate and thereby helps the growth of a dense Si film.  
15 Besides the application for photovoltaics, the electrolytic p-type Si film was employed as a  
16 binder-free anode for lithium ion batteries delivering a capacity of over 2500 mAh g<sup>-1</sup> in the first  
17 10 cycles and retaining 800 mAh g<sup>-1</sup> after 40 cycles. Moreover, this method was applied for  
18 coating Si on carbon fibers, which could be a general way to prepare Si with controllable forms  
19 and silicon/carbon core-shell structures for functional materials.

20 **Keywords:** silicon film, electrodeposition, molten salts, carbon substrate, anode materials

21

Download English Version:

<https://daneshyari.com/en/article/6603687>

Download Persian Version:

<https://daneshyari.com/article/6603687>

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