Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Improved performance in micron-sized silicon anodes by *in-situ* polymerization of its acrylic acid-based slurry

Chao Li,[a,b] Tongfei Shi,[c] Hideya Yoshitake,[d] and Hongyu Wang*[a]

[a]*State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences,5625 Renmin Street, Changchun 130022, China*

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

[c]*State Key Laboratory of Polymer Physics and Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences*

[d]*Faculty of Engineering, Yamagata University, Jyonan 4-3-16, Yonezawa 992-8510, Japan*

* Corresponding author. Tel/Fax: 86-431-85262287. Email address: hongyuwang@ciac.ac.cn (H. Wang)

Fig. S1

Reaction process: the acrylic acid monomer of solution can be polymerized at 72℃, and the C=C double bond in acrylic acid is broken. At the same time, the long chain is connected with other monomers. The dissolved-alginate in water plays the function as a thickener and increase the viscosity of solution. While the acrylic acid is added in the solution, it can form weak interaction with alginate and Si-O on the silicon surface owing to the electrostatic force. After polymerization, the long chain of poly(acrylic acid) realize the function of adhesive each others.

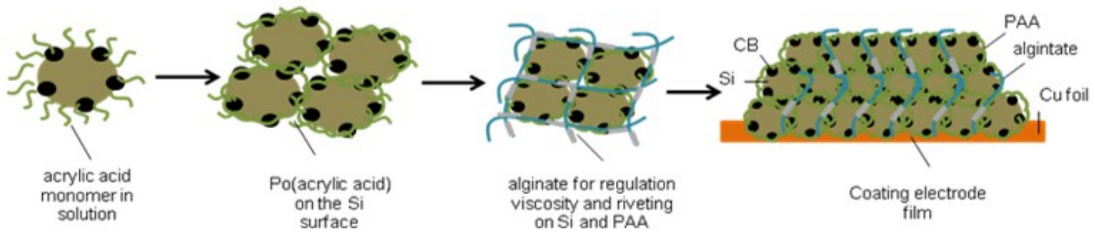

Fig. S2

SEM images of two kinds of Si electrodes, including the PA-Si electrodes of traditional mechanically-mixed slurry (a) and the cPA-Si electrodes obtained from slurry copolymerization method (b).

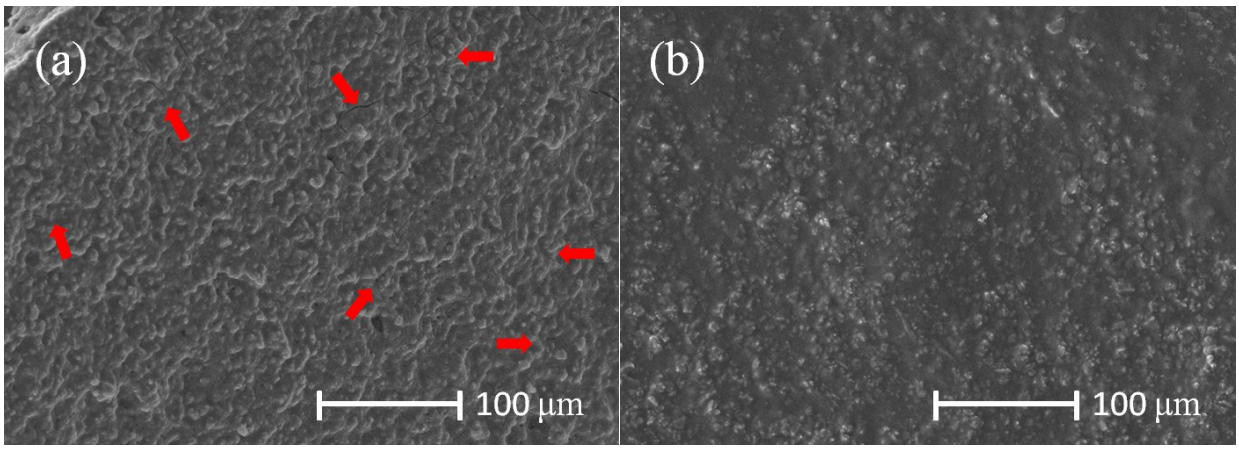

Fig. S3

AFM images of cPA-Si and PA-Si electrodes at a lithiation state, containing (a) 2D and (c) 3D images of PA-Si, (b) 2D and (d) 3D images of cPA-Si electrodes.