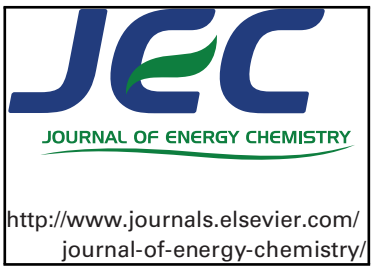

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Arafat Rahman Md. , Yat Choy Wong , Guangsheng Song ,
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Improvement on electrochemical performances of nanoporous titania as anode of lithium-ion batteries through annealing of pure titanium foils

Md. Arafat Rahman[a,d], Yat Choy Wong[a], Guangsheng Song[b], De Ming Zhu[a], Cuie Wen[c,a*]

[a]Faculty of Science, Engineering and Technology, Swinburne University of Technology, Hawthorn, Victoria 3122, Australia

[b]School of Material Science & Engineering, Anhui University of Technology, Anhui 243002, China

[c]School of Engineering, RMIT University, Melbourne, Victoria 3001, Australia

[d]Department of Mechanical Engineering, Chittagong University of Engineering and Technology, Chittagong 4349, Bangladesh

Abstract: The effect of annealing of Ti foils before anodization on the morphology and electrochemical performance of resultant nanoporous anatase TiO_2 (np-TiO_2) as anode in rechargeable lithium-ion batteries (LIBs) was investigated. The np-TiO_2 anode fabricated from annealed Ti foils exhibited higher specific surface area and reduced pore diameter compared to np-TiO_2 electrode fabricated from as-received Ti foils. The highly porous np-TiO_2 anode fabricated from annealed Ti foils exhibited 1st discharge capacity of 453.25 mAh/g and reduced to 172.70 mAh/g at 1 C current rate after 300 cycles; whilst the np-TiO_2 electrode fabricated from the as-received Ti foils exhibited 1st discharge capacity of 213.30 mAh/g and reduced to 160.0 mAh/g at 1 C current rate after 300 cycles. Even after 400 cycles, such np-TiO_2 electrode exhibited a reversible capacity of 125.0 mAh/g at 2.5 C current rate. Compared to the untreated Ti foils, the enhanced electrochemical performance of np-TiO_2 anode fabricated from annealed Ti foils was ascribed to the annealing-induced removal of residual stress among the Ti atoms. The benefit of annealing process can reduce pore size of as-fabricated np-TiO_2.

Keywords: Annealing; Nanoporous; Anatase; Titanium oxide; Anode; Lithium-ion battery

*Corresponding author. Tel.: +61 3 9925 7290; fax: +61 3 9925 6108
E-mail address: cuie.wen@rmit.edu.au (C. Wen).