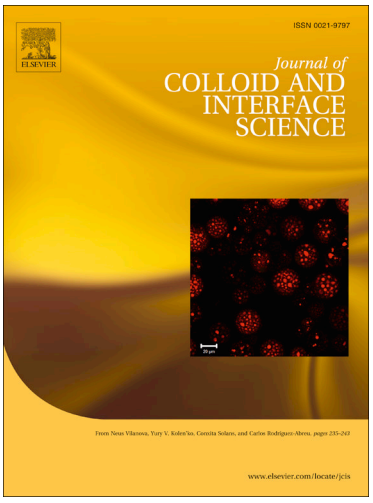

In-situ deposition of sodium titanate thin film as anode for sodium-ion micro-batteries developed by pulsed laser deposition

A. Rambabu, B. Senthilkumar, K. Sada, S.B. Krupanidhi, P. Barpanda

PII: S0021-9797(17)31413-3
DOI: https://doi.org/10.1016/j.jcis.2017.12.023
Reference: YJCIS 23095

To appear in: *Journal of Colloid and Interface Science*

Received Date: 10 November 2017
Revised Date: 6 December 2017
Accepted Date: 7 December 2017

Please cite this article as: A. Rambabu, B. Senthilkumar, K. Sada, S.B. Krupanidhi, P. Barpanda, *In-situ* deposition of sodium titanate thin film as anode for sodium-ion micro-batteries developed by pulsed laser deposition, *Journal of Colloid and Interface Science* (2017), doi: https://doi.org/10.1016/j.jcis.2017.12.023

Article Manuscript for ***Journal of Colloid and Interface Science***

In-situ deposition of sodium titanate thin film as anode for sodium-ion micro-batteries developed by pulsed laser deposition

A. Rambabu[1, 2], B. Senthilkumar[1], K. Sada[1], S. B. Krupanidhi[2] and P. Barpanda[1]*

[1] *Faraday Materials Laboratory, Materials Research Centre, Indian Institute of Science, C. V. Raman Avenue, Bangalore 560012, India.*

[2] *Quantum Structures and Device Laboratory, Materials Research Centre, Indian Institute of Science, C. V. Raman Avenue, Bangalore 560012, India.*

*Corresponding Author (P. Barpanda).
Phone: +91-80-2293-2873; Fax: +91-80-2360-7316.
E-mail id: prabeer@iisc.ac.in

Abstract:

Sodium-ion thin-film micro-batteries form a niche sector of energy storage devices. Sodium titanate, $Na_2Ti_6O_{13}$ (NTO) thin films were deposited by pulsed laser deposition (PLD) using solid-state synthesized polycrystalline $Na_2Ti_6O_{13}$ compound. The phase-purity and crystallinity of NTO in bulk and thin-film forms were confirmed by Rietveld refinement. Electron microscopy and atomic force microscopy revealed the formation of uniform ~100 nm thin film with roughness of ~4 nm consisting of homogeneous nanoscale grains. These PLD-deposited NTO thin-films, when tested in Na-half cell architecture, delivered a near theoretical reversible capacity close to 42 mAh g^{-1} involving Ti^{4+}/Ti^{3+} redox activity along with good cycling stability and rate kinetics. $Na_2Ti_6O_{13}$ can work as an efficient and safe anode in designing sodium-ion thin-film micro-batteries.