

Accepted Manuscript

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PII: S0169-4332(15)00458-4
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2015.02.142>
Reference: APSUSC 29822

To appear in: *APSUSC*

Received date: 16-8-2014
Revised date: 29-12-2014
Accepted date: 20-2-2015

Please cite this article as: F. Hekmat, B. Sohrabi, M.S. Rahmanifar, A. Jalali, Electrophoretic deposition of multi-walled carbon nanotubes on porous anodic aluminum oxide using ionic liquid as a dispersing agent, *Applied Surface Science* (2015), <http://dx.doi.org/10.1016/j.apsusc.2015.02.142>

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Electrophoretic deposition of multi-walled carbon nanotubes on porous anodic aluminum oxide using ionic liquid as a dispersing agent

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Abstract:

Multi-wall carbon nanotubes (MW-CNTs) have been arranged in nanochannels of anodic aluminum oxide template (AAO) by electrophoretic deposition (EPD) to make a vertically-aligned carbon nanotube (VA-CNT) based electrode. Well ordered AAO templates were prepared by a two-step anodizing process by applying a constant voltage of 45V in oxalic acid solution. The stabilized CNTs in a water-soluble room temperature ionic liquid (1-methyl-3-octadecylimidazolium bromide), were deposited in the pores of AAO templates which were conductive by deposition of Ni nanoparticles in the bottom of pores. In order to obtain ideal results, different EPD parameters, such as concentration of MWCNTs and ionic liquid on stability of MWCNT suspensions, deposition time and voltage which are applied in EPD process and also optimal conditions for anodizing of template were investigated. The capacitive performance of prepared electrodes was analyzed by measuring the specific capacitance from cyclic voltammograms and the charge-discharge curves. A maximum value of 50 Fg^{-1} at the scan rate of 20 mVs^{-1} was achieved for the specific capacitance.

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