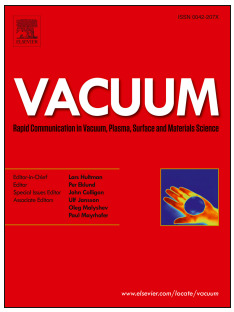
Accepted Manuscript



Electrochemical supercapacitive properties of SILAR-Deposited Mn_3O_4 electrodes

M.C. Nwankwo, A.C. Nwanya, A. Agbogu, A.B.C. Ekwealor, Paul M. Ejikeme, R. Bucher, R.U. Osuji, M. Maaza, Fabian I. Ezema

PII: S0042-207X(18)31359-9

DOI: 10.1016/j.vacuum.2018.09.057

Reference: VAC 8270

To appear in: *Vacuum*

Received Date: 28 July 2018

Revised Date: 8 September 2018

Accepted Date: 27 September 2018

Please cite this article as: Nwankwo MC, Nwanya AC, Agbogu A, Ekwealor ABC, Ejikeme PM, Bucher R, Osuji RU, Maaza M, Ezema FI, Electrochemical supercapacitive properties of SILAR-Deposited Mn_3O_4 electrodes, *Vacuum* (2018), doi: https://doi.org/10.1016/j.vacuum.2018.09.057.

Electrochemical Supercapacitive Properties of SILAR-Deposited Mn_3O_4 Electrodes

M. C. Nwankwo[1, 2], A. C. Nwanya[1,3,4], A. Agbogu[1] , A. B. C. Ekwealor[1], Paul M. Ejikeme[5], R. Bucher[3], R.U. Osuji[1,3,4], M. Maaza[3,4], and Fabian I. Ezema[1,3.4.6*]

[1] Thin Film Laboratory, Department of Physics and Astronomy, University of Nigeria, Nsukka
[2] Department of Science Education, Nnamdi Azikiwe University, Awka.
[3] Nanosciences African Network (NANOAFNET), iThemba LABS-National Research Foundation, 1 Old Faure road, Somerset West 7129, P.O. Box 722, Somerset West, Western Cape Province, South Africa.
[4]UNESCO-UNISA Africa Chair in Nanosciences/Nanotechnology, College of Graduate Studies, University of South Africa (UNISA), Muckleneuk ridge, P.O. Box 392, Pretoria-South Africa,
[5]Department of Pure and Industrial Chemistry, University of Nigeria, Nsukka
[6]Department of Physics, Faculty of Natural and Applied Sciences, Coal City University, Enugu, Nigeria

Abstract

In this study, successive ionic layer adsorption and reactions (SILAR), a simple and cost-effective method was used to successfully synthesize Mn_3O_4 thin film electrodes on fluorine-doped tin oxide (FTO) and stainless steel (ss) substrates. The synthesized films were characterized using scanning electron microscopy (SEM), X-Ray diffraction (XRD) and UV-vis-NIR spectroscopy. The electrochemical energy storage behavior of the electrodes was evaluated using cyclic voltammetery (CV), potentiostatic charge-discharge (c-d) technique and electrochemical impedance spectroscopy (EIS) in 1M solution of Na_2SO_4 electrolyte. The highest specific capacitance of 786.2Fg^{-1} was obtained at a scan rate of 5 mVs^{-1} for the 80-cycle film electrode. Our SILAR deposited Mn_3O_4 thin film electrodes is a promising material for pseudocapacitor application based on the electrochemical properties obtained.

Keywords: Mn_3O_4 thin film; SILAR; optical properties; potentiostatic charge-discharge; electrochemical impedance spectroscopy

1. Introduction

The dramatic climate change has led to a reduction in the rate of fossil fuels consumption. Energy security concerns generate great interest internationally and have resulted in developing renewable energy technologies from sustainable and renewable energy resources especially solar and wind. The unsteady and intermittent nature of solar and wind energy which poses a great challenge to humanity calls for an urgent need for efficient energy storage systems [1-3] so as to effectively

*Author to whom corresponding should be addressed (F.I. Ezema): Tel.: +234-8036239214
E-mail address: fabian.ezema@unn.edu.ng,