Materials Research Bulletin 57 (2014) 221–230

Contents lists available at ScienceDirect

Materials Research Bulletin

journal homepage: www.elsevier.com/locate/matresbu

High performance MnO_2 nanoflower electrode and the relationship between solvated ion size and specific capacitance in highly conductive electrolytes

Izan Izwan Misnon, Radhiyah Abd Aziz, Nurul Khairiyyah Mohd Zain, Baiju Vidhyadharan, Syam G. Krishnan, Rajan Jose *

Nanostructured Renewable Energy Materials Laboratory, Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, Kuantan, Pahang 26300, Malaysia

ARTICLE INFO

Article history:
Received 1 April 2014
Received in revised form 26 May 2014
Accepted 27 May 2014
Available online 2 June 2014

Keywords:
Oxide
Chemical synthesis
Electrochemical properties
Energy storage

ABSTRACT

Flower shaped birnessite type manganese oxide (δ-MnO_2) nanostructures are synthesized using a simple hydrothermal process with an aim to fabricate high performance supercapacitors for energy storage electrode. The studies reveal that layered δ-MnO_2 had a basal plane spacing of ~0.73 nm and are composed of thin nanosheets of thickness ~23 nm. A detailed investigation is undertaken to draw a relationship between the solvated ion size of alkaline electrolytes (LiOH, NaOH and KOH) and pore size in the electrode material favoring high specific capacitance and faster electrode kinetics. The present work not only develops a high performance supercapacitive material but also identifies that by suitably tuning the sizes of solvated ion and the pores, supercapacitive behavior of a single material system can be tailored.