

Potentiostatic and galvanostatic electrodeposition of manganese oxide for supercapacitor application: A comparison study

Gomaa A.M. Ali, Mashitah M. Yusoff, Yun Hau Ng, Hong Ngee Lim, Kwok Feng Chong

Faculty of Industrial Sciences & Technology, Universiti Malaysia Pahang, 26300 Kuantan, Malaysia

**Chemistry Department, Faculty of Science, Al-Azhar University, Assiut, 71524, Egypt
Particles and Catalysis Research Group, School of Chemical Engineering, The University of New South Wales, Sydney NSW 2052, Australia**

Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

Abstract; The structural and electrochemical properties of manganese oxide (MnO₂) electrodeposited by potentiostatic and galvanostatic conditions are studied. X-ray diffraction analyses confirm identical MnO₂ phase (ramsdellite) are deposited under potentiostatic and galvanostatic conditions. Under comparable current density during electrodeposition, MnO₂ deposited by galvanostatic condition shows smaller crystallite size, less compact layered structure, higher surface area and wider band gap, in comparison to the potentiostatic deposition. The MnO₂ morphology difference under different electrodeposition conditions contributes to different capacitive behaviors. The lower compactness of MnO₂ deposited galvanostatically renders facile ions diffusion, leading to higher specific capacitance with low equivalent series resistance. The findings suggest galvanostatic electrodeposition is suitable to produce MnO₂ nanostructure for supercapacitor application.

Keywords: Potentiostatic, Galvanostatic, Electrodeposition, Supercapacitors, Manganese oxide

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