

## Symp A11

### A Study on the Oxidation/Reduction at Electrodeposited Manganese Oxide Electrodes for Pseudocapacitor

전해도금된 수도커패시터용 망간산화물 전극에서의 산화/환원 반응에 대한 연구

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The mechanism of oxidation/reduction at electrodeposited manganese oxide electrodes was investigated by using scanning electron microscopy, X-ray diffractometry, ac-impedance spectroscopy and cyclic voltammetry. For this purpose, manganese oxide electrodes were deposited on a carbon substrate by galvanostatic method in 0.25 M  $\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$  solution, and then annealed at various temperatures ranging from 200° to 800 °C for 2 h in air. From the X-ray diffraction analysis, it was recognised that the degree of crystallisation of amorphous manganese oxide increased with increasing annealing temperature. The impedance spectra measured on the manganese oxide electrodes consisted of a depressed arc associated with the absorption/desorption of proton at the electrolyte/electrode interface at high frequencies and an almost vertical capacitive line at low frequencies. The size of the high frequency arc increased with increasing annealing temperature. In addition, from the analysis of the cyclic voltammograms (CVs), it was noted that the electrodeposited manganese oxide electrodes showed an ideal capacitive behaviour, which is characterised by rectangular-shaped profile. Both the specific capacitance and the rate capability of the manganese oxide electrodes decreased in value with increasing annealing temperature, which is due to the dehydration and crystallisation of the electrodes. The mechanism of oxidation/reduction was discussed in terms of the differences in the amounts of water molecules and oxidation state among the electrodes.

#### Reference

1. K.-N. Jung, S.-I. Pyun and J.-W. Lee, *Electrochim. Acta*, 49 (2004) 4371.