

Physical and electrochemical properties of ZnO films fabricated from highly cathodic electrodeposition potentials

ABSTRACT

The physical and electrochemical properties of zinc oxide (ZnO) film electrode that were prepared electrochemically were studied. ZnO was electrodeposited on ITO glass substrate by applying three different highly cathodic potentials (-1.3 V, -1.5 V, -1.7 V) in a solution containing 70 mM of $\text{Zn}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O}$ and 0.1 M KCl with bath temperatures of 70 °C and 80 °C. The presence of ZnO was asserted from XRD analysis where the corresponding peaks in the spectra were assigned. SEM images revealed the plate-like hexagonal morphology of ZnO which is in agreement with the XRD analysis. The areal capacitance of the ZnO was observed to increase when the applied electrodeposition potential is increased from -1.3 V to -1.5 V. However, the areal capacitance is found to decrease when the applied electrodeposition potential is further increased to -1.7 V. The resistance of charge transfer (R_{ct}) of the ZnO decreased when the applied electrodeposition potential varies from -1.3 V to -1.7 V due to the decreased particle size of ZnO when more cathodic electrodeposition potential is applied.

Keyword: ZnO thin films; Electrochemical deposition; Highly cathodic potential; Electrochemical impedance spectroscopy