

Room temperature and seed layer free electrochemical elaboration of ZnO-nanowires and thin films highly c-axis oriented

H. Belkhalfa, N. Dokhan, A. Badidi-Bouda

Abstract : In this present work we report the electrodeposition at room-temperature and without seed-layer of well-aligned and highly c-axis oriented ZnO nanowires and ZnO thin films. The electrodeposition was performed in a classical three electrodes electrochemical cell, under potentiostatic mode and without stirring. The substrates used were molybdenum foil, ITO-glass and aluminium foil. The electrolytic bath was initially composed of 5mM ZnCl₂, 5mM H₂O₂ and 100 mM KCl as supporting electrolyte, the pH value being about 6.8. The ZnCl₂ concentration was progressively modified, and this gives morphological modification of the deposits. Samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), and Raman spectroscopy to give information about microstructure, morphology and crystalline phases. The morphology observed by SEM showed that the increasing of ZnCl₂ concentration will increase the average diameter of the ZnO-nanowires, until obtaining thin films. DRX spectra confirm the elaboration of ZnO-deposits with highly c-axis orientation. These important result will promote the facile use of electrodeposition to elaborate ZnO nanostructures and thin films for several technological applications as nanogenerators, SAW devices, DSSC, ETA solar-cells, water-splitting, sensing, etc.

Keywords : ZnO, nanowires, thin film, electrodeposition