

The Effects of pH on the Electrochromism in Nickel Oxide Films

Authors : T. Taşköprü, M. Zor, E. Turan

Abstract : The advantages of nickel oxide as an electrochromic material are its good contrast of transmittance and its suitable use as a secondary electrochromic film with WO₃ for electrochromic devices. Electrochromic nickel oxide film was prepared by using a simple and inexpensive chemical deposition bath (CBD) technique onto fluorine-doped tin oxide (FTO) coated glass substrates from nickel nitrate solution. The films were face centered cubic NiO with preferred orientation in the (2 0 0) direction. The electrochromic (EC) properties of the films were studied as a function of pH (8, 9, 10 and 11) in an aqueous alkaline electrolyte (0.3 M KOH) using cyclic voltammetry (CV). The EC cell was formed with the following configuration; FTO/nickel oxide film/0.3 M KOH/Pt. The potential was cycled from 0.1 to 0.6V at different potential sweep rates in the range 10- 50 mV/s. The films exhibit anodic electrochromism, changing colour from transparent to black. CV results of a nickel oxide film showed well-resolved anodic current peak at potential; 45 mV and cathodic peak at potential 28 mV. The structural, morphological, and optical changes in NiO film following the CV were investigated by means of X-ray diffractometer (XRD), field emission electron microscopy (FESEM) and UV-Vis- NIR spectrophotometry. No change was observed in XRD, besides surface morphology undergoes change due to the electrical discharge. The change in transmittance between the bleached and colored state is 68% for the film deposited with pH=11 precursor.

Keywords : nickel oxide, XRD, SEM, cyclic voltammetry

Conference Title : ICNSE 2015 : International Conference on Nanomaterials Science and Engineering

Conference Location : Venice, Italy

Conference Dates : November 09-10, 2015