

STRUCTURAL CHARACTERISTICS OF ZINC OXIDE THIN FILMS OBTAINED BY CHEMICAL BATH DEPOSITION

Berestok T.O.¹, Kurbatov D.I.¹, Opanasyuk A.S.¹,

Kuznetsov V.M.²

¹ *Sumy State University, Sumy, Ukraine*

² *Applied Physics Institute NAS of Ukraine, Petropavlovskaya, Sumy, Ukraine*

Due to the large band gap, high charge-carrier mobility, high exciton binding energy, low toxicity, high thermal and radiation stability, zinc oxide is considered as a promising material for fabrication gas detectors, sensors of ultraviolet light, electroluminescence devices. Furthermore, chemically deposited ZnO films are widely used as conductive and optical cover layers of solar cells. Among the various methods of ZnO thin films obtaining, chemical bath deposition is one of the promising non-vacuum method of synthesis of layers with controllable structural and electrophysical properties.

Nanotextured ZnO films were chemically deposited onto pre-cleaned glass substrates from aqueous solution of zinc nitrate hexahydrate and ammonia solution at temperature of 90 °C. Films deposition time was ranged from 30 to 120 minutes. After the deposition the samples were rinsed with distilled water in order to clean the condensates from unnecessary sediment. Structural investigations were carried out using scanning electron microscopy and X-Ray analysis. Phase analysis was performed by comparing interplane distances and specific intensities of diffraction patterns from the investigated samples and etalon. Texture quality of obtained films was estimated using Harris method. To determine the size of the coherent scattering domain size (CSD), microstrains and concentration of dislocation in the films there was used Williamson - Hall method. The values of the lattice constant a , c of the material were computed by Nelson-Riley extrapolation method.

X-Ray analysis revealed that obtained films correspond to single-phase of ZnO with hexagonal structure and lattice constants

$a=0.3248-0.3254$ nm and $c=0.5201-0.5211$ nm which depend on duration of the deposition. The films were textured and have growth texture [100]. The values of CSD were equal to $L_{(002)} = (26,1-41,7)$ nm, values of microstrain were varried in the range of $\varepsilon=(0.60-3.09)\cdot 10^3$, and dislocation density was equal to $5.97 \cdot 10^{14}$ lin/m².

Thus, there were found the regimes of obtaining procedure of chemically-deposited ZnO films with predictable structural characteristics.

Structural characteristics of zinc oxide thin films obtained by chemical bath deposition/Berestok T.O., Kurbatov D.I., Kuznetsov V.M., Opanasyuk A.S.//2nd Annual International Conference on Physics, 21-24 July 2014