Journal of Physics: Conference Series 2018 vol.1058 N1

On the question of structure of ZnO thin films formed by IBAD and subsequently implanted with silver ions

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Abstract

© 2018 Institute of Physics Publishing. All rights reserved. Nanocrystalline ZnO thin films with a thickness of ~ 235 nm were synthesized by ion beam-assisted deposition (IBAD) technique using a metal target of zinc and oxygen (O2) as a reactive gas. The near-surface region of the synthesized films was subsequently implanted with 30 keV Ag+ ions in the fluence range of (0.25-1)×1017 ion/cm2 at high ion current density of 12 μA/cm2. The structure parameters and morphology of as-deposited and subsequently implanted with silver ions ZnO films were investigated by X-ray diffraction and scanning electron microscopy techniques. It was found that the as-deposited ZnO films have inhomogeneous structure, which consists of nanocrystallites and disordered amorphous phase. The nanocrystallites of the obtained ZnO thin films have values of lattice parameters higher than for a bulk ZnO. Subsequent implantation with silver ions leads to a significant radiation heating and microstress relaxation of the film as well as to an increase in the size of nanocrystallites due to the amorphous phase.

http://dx.doi.org/10.1088/1742-6596/1058/1/012077

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