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Effect of implantation regimes of silver ions on the structure and optical properties of zinc-oxide nanocrystalline films

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Abstract

© 2016, Pleiades Publishing, Ltd. Thin (about 270 nm) nanocrystalline films of zinc oxide (ZnO) are obtained on quartz substrates using ion sputtering and irradiated with Ag⁺ ions at an energy of 30 keV and relatively high fluences at ion current densities of 4, 8, and 12 $\mu\text{A}/\text{cm}^2$. The X-ray analysis, scanning electron microscopy, and optical spectroscopy are used to study the effect of irradiation dose and ion current density on the structural modification and optical properties of the ZnO films. Nontrivial dependences of the structural and optical parameters of the films on the ion irradiation regimes are due to radiation heating and film sputtering under the action of the ion beam, diffusion of impurity, formation of silver nanoparticles in the irradiated layer at high implantation fluences, and the diffusion of implanted impurity at relatively high ion current densities.

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