

Optical properties of ZnO and Al₂O₃ implanted with silver ions

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Abstract

ZnO and Al₂O₃ samples implanted with 30-keV silver ions with fluences in the interval $(0.25-1.00) \times 10^{17}$ ions/cm² are studied by the method of optical photometry in the visible part of the spectrum. The optical transmission spectra of the implanted samples exhibit a selective band associated with surface plasmon resonance absorption of silver nanoparticles. The intensity of this band nonmonotonically depends on the implantation fluence. The silver ion depth distribution in the samples is calculated. It is shown that the non-monotonicity observed in experiments is due to an increase in the substrate sputtering ratio with increasing implantation fluence. It is found that vacuum thermal annealing of the implanted Al₂O₃ layers up to 700°C causes a considerable narrowing of the plasmon absorption bandwidth without a tangible change in its intensity. At higher annealing temperatures, the plasmon absorption band broadens and its intensity drops. Annealing of the ZnO films under such conditions causes their complete vaporization. © 2014 Pleiades Publishing, Ltd.

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