Structural, optical and morphological properties of pure and silver doped zinc oxide thin films by attuning the deposition layer

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ABSTRACT
Pure Zinc oxide (ZnO) and silver doped ZnO (Ag/ZnO) thin films have potential applications in many optoelectronic devices. In this work, ZnO and Ag/ZnO thin films were prepared by a low-cost sol–gel method followed by a spin coating technique on glass substrates. Both ZnO and Ag/ZnO were spin-coated at various deposition layers (ranging from 3 to 11 deposition layers) to investigate the correlation of films' thickness on the structural and optical properties. All the prepared films were subjected to an annealing temperature of 300 °C for 1 hr. The results showed that ZnO and Ag/ZnO XRD patterns had polycrystalline wurtzite structures with (101) direction domination. On the other hand, with the addition of silver dopant, the optical properties were improved at a transmittance value greater than 90% compared to ZnO (80% transmittance). FESEM results revealed that the ZnO thin film's average grain measurement was about 65.4 nm, while Ag/ZnO exhibits grain measurement of approximately 69.3 nm. The surface morphologies showed that Ag/ZnO thin films exhibit a rougher surface due to the aggregation of silver nanoparticles. Despite the existence of agglomerated nanoparticles and higher deposition layer, the optical transmission of the Ag/ZnO is undistorted.

KEYWORDS
Film thickness; Metal doping; Sol–gel; Spin-coating

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