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The effects of different sputtering process parameters on the properties of Ti-doped ZnO thin film

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ZnO is a II–VI semiconductor with a wide and direct band gap (3.4 eV), excellent chemical and thermal stability, specific electrical and optoelectronic properties . It has recently gained much interest because of its potential use in many applications, Ti-doped ZnO films, in comparison with the ZnO films doped with Group III elements, have more than one charge valence state. This means Ti-doping can create more free electrons and enhance n-type conductivity. The electrical and optical properties of Ti doped ZnO films have also been extensively investigated.
This paper reports on the effects of different sputtering deposition process parameters (oxygen partial pressure, working pressure, power sputtering) on the electrical, optical, structural and morphological properties of Ti-doped ZnO deposited by D.C. magnetron sputtering from both Zn and Ti targets in a mixture of oxygen and argon gases with a target-to-substrate distance of 9.5 cm.. The thin films were deposited at temperature of 300 °C.
The microstructure, surface morphology and optical properties in ZnO:Ti films were systematically investigated via X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), ultraviolet visible (UV–Vis) spectrophotometer and four-point. The results indicated that Ti-doped ZnO X-ray films have a hexagonal wurtzite structure with the [002] preferred crystallographic direction, and All ZnO:Ti films have an average transmittance above 90 % in the visible region, and the lowest electrical resistivity of 1.8 × 10−3 Ω·cm

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