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Effect of RF power on optical and structural properties of RF sputtered ZnO thin films

Lahcen Nkhaili, Abdelkader Outzourhit, Mustapha Ait Ali , Elyagoubi Mesbah

Solid State Physics and Thin Films Laboratory, Faculty of Sciences Semlalia, Cadi Ayyad University, PO Box: 2390, Marrakech 4000, Morocco

Lahcen.com@hotmail.fr

ZnO thin films were deposited by radio frequency (RF) Sputtering from a pure Zn target with a gas mixture of 30% O_2 and 70% Ar at different RF powers.
Structural properties, of the as-deposited thin films, were studied by X ray Diffraction (XRD). Optical properties (especially the refractive index, absorption coefficient and optical band gap) were investigated by optical transmission measurements in the Ultraviolet-Visible-Near Infrared (UV-Vis-NIR) wavelength range (Figure 1).
XRD diagrams show that the deposited ZnO thin films are crystalline with the size of crystallites varying with RF power with a maximum at 200 W .
The deposition rate of these films deduced from optical transmission measurements varied from 2.55 nm/min to 6.22 nm/min with RF power with a maximum at 200 W.
The Tauc's optical band gap Eg is quasi-constant (about 3.2 eV) when the RF power is increased from 100 to 300 W. Moreover, the refractive index follows well the Cauchy's law with an extrapolated value, at infinite wavelength region, of about 1.9 when the RF power is varied.

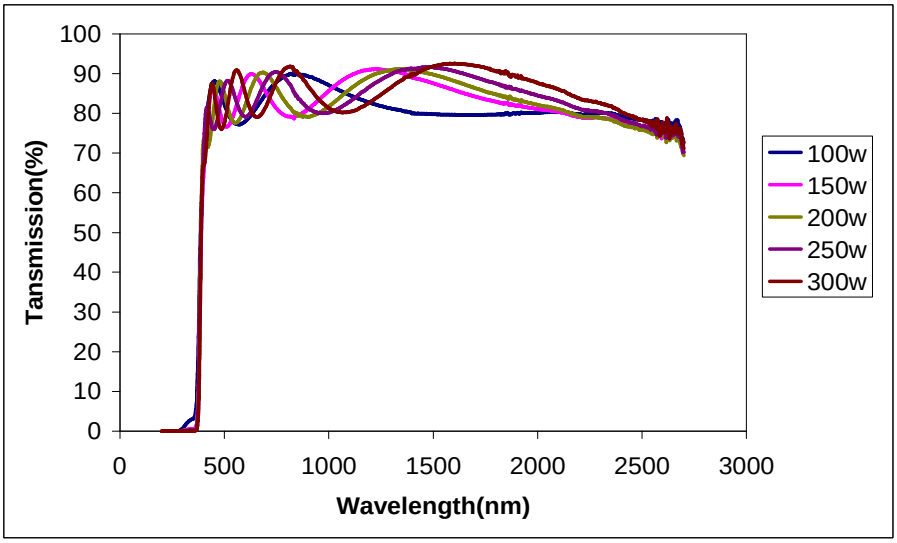

Figure 1. Optical transmission spectra of ZnO films deposited at various RF powers (100W; 150W; 250W and 300W).