Simultaneous ir (1064 nm) pulsed laser deposition and annealing of zno films with an splitted 1064 nm beam

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Zinc Oxide (ZnO) thin films had been elaborated at room temperature using an innovative PLD system with a simultaneous IR pulsed laser annealing of the substrate during the deposition. The deposition was performed using sintered ZnO targets under a 2 mbar oxygen pressure. The IR laser (Nd:YAG, 1064 nm), was splitted in two different beams used for the ablation process with a constant fluence (7 J/cm^2) and to heat the substrate surface. The chemical composition and morphological, structural and optical properties of thin films has been studied as a function of laser annealing fluence. With the increasing in the annealing laser fluence, the oxygen concentration in the films, the cristalinity of thin films in the preferencially direction (002) and the grain size increases, while there the film thickness and the optical transmittance decreases. The optical gap shifts to low values (3.28 eV) regardless the laser annealing fluence. The PL spectra shows two main bands centered around 370 and 570 nm. Our studies have demonstrate that the intensity of the UV band increases with the laser annealing, while the intensity of the visible band decreases. This evidence is in agreement with the change in the films stoichiometry, so that our instrumental approach allows the obtention of films with tailored characteristics over substrates that it can not be directly heated.

References:

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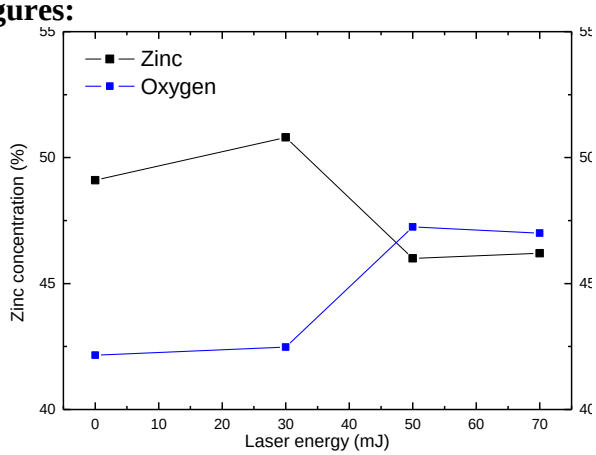
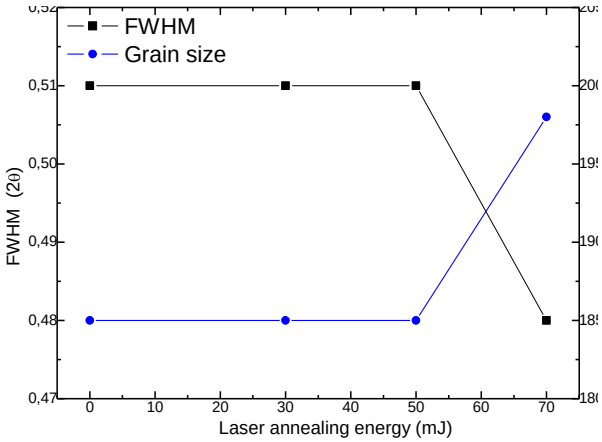
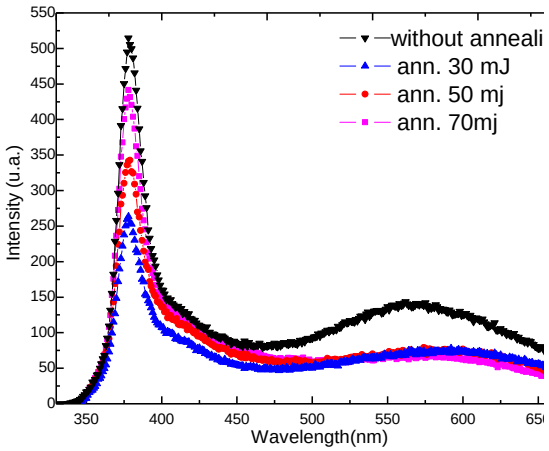
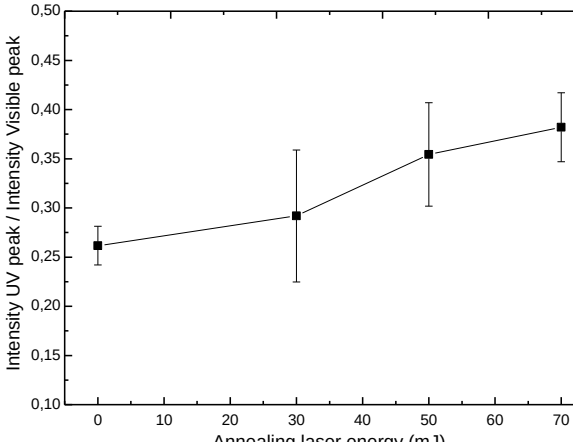
Figures:


Zinc
Oxygen
Zinc concentration (%)
Laser energy (mJ)


FWHM
Grain size
FWHM (2θ)
Laser annealing energy (mJ)


without anneali
ann. 30 mJ
ann. 50 mj
ann. 70mj
Intensity (u.a.)
Wavelength(nm)


Intensity UV peak / Intensity Visible peak