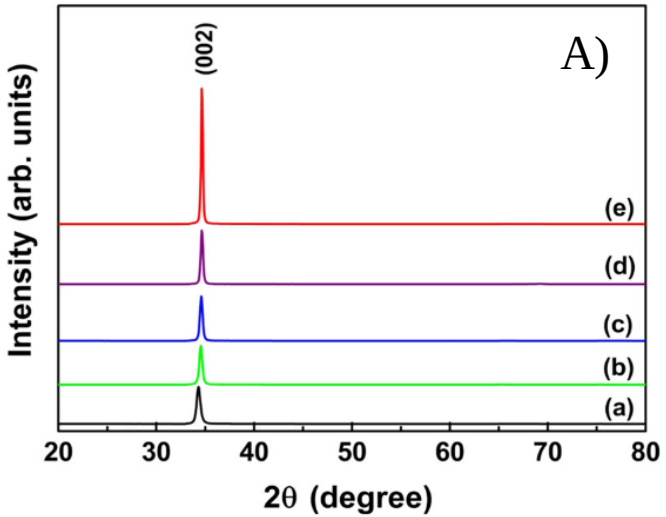
Microstructural evolution of sputtered ZnO thin films with rapid thermal annealing

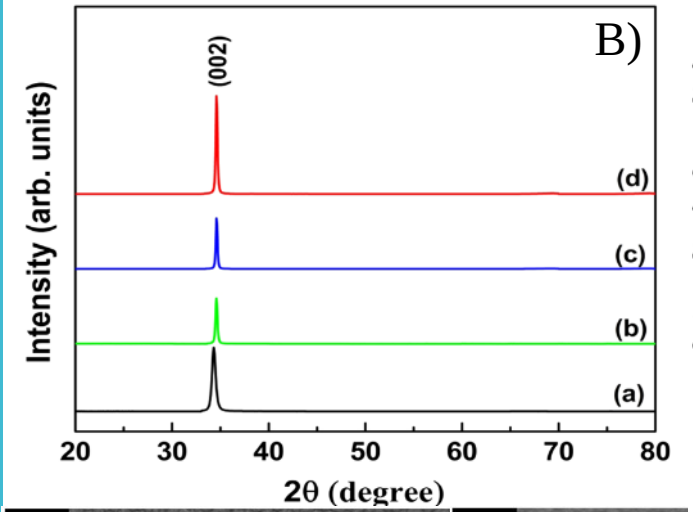
DOI: 10.1007/s10854-015-3436-y

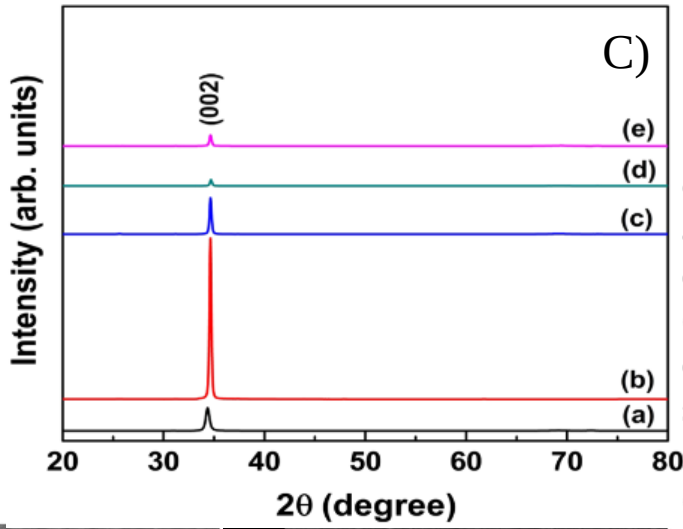
Thin film were deposited on to n-type Silicon wafers using RF magnetron sputtering and rapidly annealed at different temperatures, times and different annealing atmospheres controlling the oxygen influx ratio.

X ray diffraction was carried out on a Rigaku/UltimalV with a CuKa (l=0.154nm) radiation obtaining data from 20 to 80 2 theta.

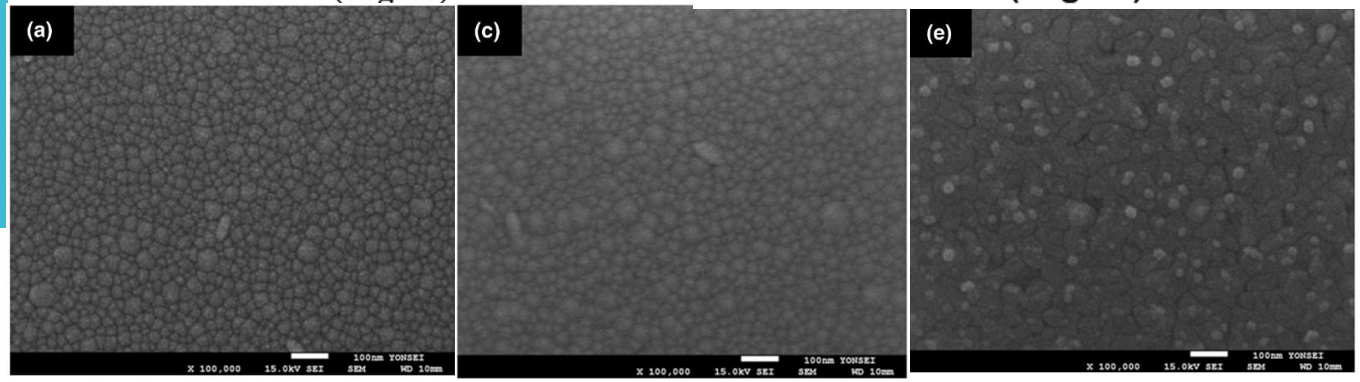
Best rapid thermal annealing conditions were set to be 150s annealing at 1000°C with a oxygen influx of 150 ml/min







- Zinc oxide thin film rapid thermal annealing have a significant impact on the diffraction pattern that can be obtained. In A) different annealing temperature were tested from as deposited up to 1000°C, an increase in the intensity of the (002) peak can be observed. From this point different annealing processes were studied on the research. B) shows the effect of oxygen influx rate during 150s annealing process being the higher influx rate (150ml/min) the best option to improve the intensity of the (002) peak. In C) different annealing times were tested at 1000°C being 150s the best annealing time. A drop in crystallinity can be observed due to amorphization of the films due to the annealing process.



SEM images were obtained after annealing the films at different temperatures. (a) shows the as deposited Surface, (b) show the Surface after annealing at 600°C and (c) show the Surface after annealing at 1000°C. Morphological changes can be observed smaller grains tend to coalesce to form bigger grains with greater Surface roughness.

Héctor Martínez