

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Properties of p-type ZnO Films co-doped with Lithium and Phosphorus¹ TOM ODER, MICHAEL MCMASTER, ANDREW SMITH, Youngstown State University — Thin films of ZnO co-doped with lithium and phosphorus were deposited on sapphire substrates by RF magnetron sputtering. The films were sequentially deposited from ZnO and Li₃PO₄ solid targets on the substrates maintained at 500 °C. An undoped ZnO buffer layer was first deposited at a substrate temperature of 900 °C for 2 hours. Post deposition annealing was carried using a rapid thermal processor in N₂ and O₂ at temperatures ranging from 400 °C to 900 °C for 3 min. Analyses performed using low temperature photoluminescence spectroscopy measurements reveal several luminescence peaks at 3.36, 3.353, 3.317, 3.11 and 2.33 eV whose relative intensities vary with annealing environments and temperatures. We will discuss the origins of these luminescence peaks and their relevance to p-type doping of ZnO films. The x-ray diffraction 2θ -scans for all the films showed a single peak at about 34.4° with FWHM of about 0.17°. Hall Effect measurements revealed conductivities that change from p-type (with concentration up to about $1.3 \times 10^{17} \text{ cm}^{-3}$) to n-type (with concentration up to about $1.5 \times 10^{19} \text{ cm}^{-3}$) as the annealing temperature is increased to 900 °C.

¹The authors gratefully acknowledge the funding support from NSF.

Tom Oder
Youngstown State University

Date submitted: 20 Nov 2012

Electronic form version 1.4