

Abstract Submitted  
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**Comparison of uniform and delta doped p-type ZnO thin films<sup>1</sup>**

RAVICHANDRA GADE, TOM ODER, Youngstown State University — The properties of uniform and delta doped p-type ZnO thin films deposited by RF magnetron sputtering from ZnO and Li<sub>3</sub>PO<sub>4</sub> solid targets on c-plane sapphire substrates have been characterized. Uniform doping was achieved by simultaneous deposition of the films from the ZnO and Li<sub>3</sub>PO<sub>4</sub> targets at 300 °C to a thickness of about 1 μm. For delta doping, the deposition from the Li<sub>3</sub>PO<sub>4</sub> target was blocked every two minutes. Post-deposition annealing was carried using a rapid thermal processor in O<sub>2</sub> at 500 - 900 ° C for 3 min. Analyses performed using photoluminescence spectroscopy measurements revealed luminescence peaks at 3.35 and 3.30 eV at 12 K for the uniform doped and delta-doped films, respectively. Hall effect measurements revealed *p*-type conductivities with average Hall concentrations of 2.71 x 10<sup>14</sup> and 2.17 x 10<sup>15</sup> cm<sup>-3</sup> for the uniform and delta doped films, respectively. These *p*-type conductivities however were unstable and sometimes yielded *n*-type conductivities with repeated measurements. The fluctuation in the carrier type could be due to small Hall voltages in the measurements, which can be significantly impacted by small spikes in signal noise inherent in the measurements.

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