Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electronic and Structural Properties of InGaZnO Thin Films D.S. WILLIAMS, S. SALLIS, L.F.J. PIPER, B.E. WHITE, Binghamton University —
We examine the effects of oxygen partial pressure during deposition and the structural changes resulting from a post-deposition anneal on the transport properties of InGaZnO. Amorphous oxygen-deficient samples sputter-deposited from a target with an atomic ratio of 2:2:1:7 at 50 watts DC in a 3 mTorr argon atmosphere have a resistivity of 0.16 ohm-centimeters. Amorphous oxygen-rich samples deposited similarly, except for a 10% oxygen partial pressure, are insulating. For both samples, the as-deposited surfaces show a consistent grain size of approximately 30 nm. A subsequent rapid thermal anneal at 600C for 10 seconds leads to the coalescing and vertical growth of the grains with a resultant thinning of the background matrix. After anneal, the resistivity of the oxygen-deficient sample is decreased to 0.003 ohm-centimeters and 0.005 ohm-centimeters for the oxygen-rich sample. X-ray diffraction, scanning electron microscopy, atomic force microscopy and x-ray photoelectron spectroscopy data are presented to explain these changes and suggest possible methods of tuning the properties of InGaZnO for future use in thin film transistors, flexible electronics, transparent conductors and thermoelectric materials.

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Date submitted: 11 Nov 2011

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