Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Optimization of amorphous In-Zn-O (IZO) transparent conductor sputtered at ambient temperature ANDREW LEENHEER, Colorado School of Mines, JOHN PERKINS, National Renewable Energy Laboratory, ANDREW CAVENDOR, Colorado School of Mines, MATTHEW TAYLOR, MAIKEL VAN HEST, DAVID GINLEY, National Renewable Energy Laboratory — Amorphous indium zinc oxide (IZO) is an n-type transparent conducting oxide (TCO) that offers high electrical conductivity, visible-spectrum transparency, smoothness and ease of deposition, all properties of interest for photovoltaic and optoelectronic applications. Previous work has shown that magnetron-sputtered IZO is amorphous over the metals-only composition range ∼55 to 85 atomic % indium. In this work, five different single-composition targets spanning the amorphous range were used to sputter thin films at ambient temperature with varying oxygen content in the sputter gas. In addition, highly resistive films were deposited to make field-effect thin-film transistors. The resistivity, carrier concentration, and hall mobility, as well as the optical transmission and reflection for λ=300-900 nm light were measured for each film. The conductivity was tunable from ∼2.5 x 10^3 S/cm to ∼10^{-3} S/cm depending on the amount of oxygen present. Generally, increasing the oxygen or lowering the indium content lowers the carrier concentration, while increasing the indium content increases the electron mobility. For thin-film transistors, a low carrier concentration but high mobility is desired.

Andrew Leenheer
Colorado School of Mines

Date submitted: 20 Nov 2006 Electronic form version 1.4