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High Resolution Photoluminescence Spectroscopy of Doped ZnO nanowires SENTHIL KUMAR ESWARAN, FAEZEH MOHAMMADBEIGI, DENG ZHIWEI, IAN ANDERSON, SIMON WATKINS, Department of Physics, Simon Fraser University — ZnO is a material with a very promising optical properties for visible and ultraviolet optoelectronics applications. The control of doping in single crystal epitaxial material is challenging both for n- and p-dopants due to the large n-type background doping typically present. In this paper we discuss recent efforts to dope ZnO nanowires with various n and p-type dopants using the metalorganic chemical vapor deposition growth technique (MOCVD). The nanowire geometry has the advantage of producing near perfect single crystals decoupled from the highly mismatched sapphire substrate. In this way we are able to observed remarkable narrow PL linewidths as low as 0.17 meV in an ensemble of wires. Careful addition of the group III impurities Al and In results in the unambiguous identification of several sharp line bound exciton features. The addition of n-dopants has strong effects on the nanowire morphology, resulting a in a large increase in the lateral growth rate. Antimony is claimed to produce p-type material by several groups, however we show that careful backdoping of single crystals with antimony results in the appearance of a new donor bound exciton transition, providing confirmation of recent channeling measurements, as well as theoretical predictions that Sb prefers to reside on the Zn sublattice.

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