

UNH Materials Science Seminar

2:00-3:00 pm, Tuesday, August 2, 2005

DeMeritt Hall 209B

University of New Hampshire

Growth Mechanisms and Nanochemical Science of Cu(In,Ga)Se₂ and Their Effects on Solar Cell Performance

Professor Angus Rockett

University of Illinois

A review is presented of the basic materials science of the leading candidate material for thin film solar cells, Cu(In,Ga)Se₂. Epitaxial growth of this semiconductor by a sputtering process is described. Studies of the surface morphology of the grown films along with examination of other materials by transmission electron microscopy shows that, surprisingly, the close-packed polar surfaces are the lowest energy surfaces. The non-polar (110) type surface, most favored in typical compound semiconductors, spontaneously decomposes into the polar facet planes. Examination of the resulting morphologies demonstrates the growth mechanism. The surface electronic structure is further examined by photoelectron spectroscopy and the surface is shown to be p-type or intrinsic as grown but can be doped n-type when finished into a solar cell. The results are discussed in relation to solar cell operation and the opportunities for future progress in CIGS-based devices.