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Tuning the Electronic Band Structure of Copper Selenide Cu2Se Thin Films Grown via Molecular Beam Epitaxy[1] RYAN VAN HAREN, TOYANATH JOSHI, DAVID LEDERMAN, University of California, Santa Cruz — Copper chalcogenides, compounds consisting of copper and one or more of the chalcogen family of elements S, Se, and Te, have recently become of interest to materials scientists for their unique electronic band structures and predicted electronic topological behavior. Of particular interest among this class of materials is the copper selenide Cu2Se. This material has long been known to be an excellent thermoelectric material and has recently garnered interest for its electronic band structure that is tunable by introducing copper vacancies into the crystal structure. In this work, we will present our successful growths of high quality, single phase, copper deficient Cu2Se thin films in the (200) orientation via molecular beam epitaxy. Using reflection high energy electron diffraction (RHEED) and x-ray diffraction (XRD) measurements, we will show how we are able to quantify the copper concentration by analyzing the subtle shifts in our observed XRD spectra corresponding to small changes in the lattice spacing due to these copper vacancies. In this manner we will demonstrate how we are able to tune the copper vacancies and electronic band structure by precise control of the crystal's growth parameters.

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