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Soft x-ray spectroscopy of Ca-doped BiCuOSe thin films grown by pulsed laser deposition JASON FRANCIS, JANET TATE, Physics Department, Oregon State University, SHAWN SALLIS, LOUIS PIPER, Physics Department, SUNY Binghamton — Thin films of Ca-doped BiCuOSe were grown on (001) MgO and $SrTiO_3$ substrates via pulsed laser deposition. X-ray absorption and emission spectroscopy were used to analyze the O K-edge and Cu $L_{3,2}$-edge in order to determine the bulk electronic structure of BiCuOSe. Analysis of the O K-edge XAS/XES spectra yield a band gap of $\sim$1 eV, consistent with optical measurements on thin films. Optical measurements on single crystals show a band gap of $\sim$0.83 eV. XAS/XES results show the presence of strongly hybridized Bi $6s$ - O $2p$ orbitals in undoped samples. This hybridization is diminished in doped samples, providing strong evidence of Ca^{2+} on the Bi^{3+} site. X-ray diffraction measurements show that the films are highly oriented, with rocking curves around the (003) peak having a FWHM of 1°. Expansion of the c-axis is observed as Ca concentration is increased. All films show p-type conductivity and develop more metallic character as calcium doping increased. Ca concentration was determined by EPMA, which shows non-stoichiometric transfer of Ca from the target into the films.

Jason Francis
Physics Department, Oregon State University

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