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A Metastable Alloy ($Sn_{1-x}Ca_x$)S: Growth and Characterization[1]
BETHANY MATTHEWS, JAMES HAGGERTY, Department of Physics, Oregon State University, Corvallis OR 97331, STEPHAN LANY, National Renewable Energy Laboratory, Golden, CO 80401, JANET TATE, Department of Physics, Oregon State University, Corvallis OR 97331 — Two sulfide systems with different crystal structures SnS (orthorhombic) and CaS (rocksalt) were deposited by pulsed laser deposition to form metastable alloys of varying composition ($Sn_{1-x}Ca_xS$). The film composition was controlled using separate SnS_2 and CaS targets: a) a layering technique using 2 different targets and b) using a single target of a mixture of the two systems and varying T_{sub} to evaporate the more volatile cation Sn. The alloyed films' optical and structural properties were analyzed as a function of composition by optical spectroscopy and grazing incidence x-ray diffraction (GIXRD) respectively. Film stoichiometry was determined by electron probe microanalysis (EPMA). EPMA results indicated that, for $Sn_{1-x}Ca_xS_y$ layered films, the cation ratio was as expected, allowing for tuning of x; however, films were severely sulfur deficient. DFT calculations of the alloy predict a structural transition at x>0.18; however, GIXRD indicates films are still predominantly orthorhombic for $x = 0.25$.

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