Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**Scaleable photovoltaic absorber materials within the Cu-Sb-S system**[1] ADAM WELCH, Colorado School of Mines/NREL, WILLIAM TUMAS, DAVID GINLEY, National Renewable Energy Laboratory, COLIN WOLDEN, Colorado School of Mines, ANDRIY ZAKUTAYEV, National Renewable Energy Laboratory, NATIONAL RENEWABLE ENERGY LABORATORY COLLABORATION, COLORADO SCHOOL OF MINES COLLABORATION — The Cu-Sb-S system contains four ternary compounds which may hold promise for scalable, non-toxic, and efficient solar photoconversion. Like similar compounds $CuInSe_2$, CIGS, and CZTS, the Cu-Sb-S compounds are predicted to offer high absorption coefficients, and electrically benign grain boundaries. Antimony, instead of indium or gallium, has the advantage of lower cost and greater availability, as well as theoretically predicted better photon absorption. It also has a potential advantage over CZTS, as the Cu-V-S compound avoids the deep traps associated with antisite defects. Here, we synthesize two compounds within the Cu-Sb-S system, $Cu_{12}Sb_4S_{14}$ (tetrahedrite) and $CuSbS_2$ (chalcostibite), by combinatorial RF magnetron co-sputtering from $Cu_2S$ and $Sb_2S_3$ targets. Chalcostibite films were found to have good optical and electrical properties, with a steep absorption onset at 1.5eV, high absorption coefficient ($> 10^5$cm$^{-1}$), good carrier concentration ($p = 10^{17}$cm$^{-3}$) and mobility (0.2 cm$^2$/V-s). Chalcostibite growth conditions were therefore further optimized and it was found that an overflux of vapor phase $Sb_2S_3$ allowed strict control of stoichiometry for better device integration.

[1]Sunshot Contract No. DE-AC36-08GO28308 to NREL

Adam Welch
Colorado School of Mines/NREL

Date submitted: 14 Nov 2013 Electronic form version 1.4