

Abstract Submitted  
for the MAR13 Meeting of  
The American Physical Society

**Local structure of Cu<sub>2</sub>S/ZnS multi-layer films prepared using ALD**<sup>1</sup> FRANK BRIDGES, LEILA JEWELL, ANDREW SHORT, GLENN ALERS, SUE A. CARTER, UCSC — We present local structure studies of ZnS, Cu<sub>2</sub>S, and ZnS/Cu<sub>2</sub>S composite films, using extended x-ray absorption fine structure (EXAFS) technique. The films were prepared using atomic layer deposition (ALD), which can in principle deposit films layer by layer and hence form mesoscopic structures. ZnS and Cu<sub>2</sub>S films prepared using ALD are very similar to the bulk material; the main difference is a reduced amplitude for the second neighbor Zn-Zn peak in ZnS, suggesting increased disorder within the film. Relative disorder in the films also increases with decreasing thickness as well as with decreasing deposition temperature. More importantly, multi-layer ZnS/Cu<sub>2</sub>S films prepared using the same parameters as for individual films do not produce the expected multi-layer for  $\sim 1$  nm thick layers. If there is some excess Zn, the multi-layer is predominately ZnS and the Cu<sub>x</sub>S fraction is highly disordered, and may include some ZnS:Cu. In contrast if there is a little Cu excess, the film is nearly all Cu<sub>2</sub>S and the small Zn fraction is highly disordered ZnS with a shifted Zn-S distance. Consequences for multi-layer formation for solar cell applications will be discussed.

<sup>1</sup>Support: NSF DMR-1006190

Frank Bridges  
UCSC

Date submitted: 14 Dec 2012

Electronic form version 1.4