Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Transition Metal Disulfide Films by Reactive Sputtering: Structure, Magnetism, and Electronic Transport A. BARUTH, M. MANNO, D. NARASIMHAN, A. SHANKAR, X. ZHANG, E. S. AYDIL, C. LEIGHTON, University of Minnesota - Twin Cities — Transition metal disulfides (*i.e.*, TMS_2, where TM = Cu, Co, Fe, Ni, etc.) are a unique class of materials displaying diverse functional properties such as highly spin-polarized ferromagnetism ($Co_{1-x}Fe_xS_2$), superconductivity (CuS_2), a Mott insulating ground state (NiS_2), and unusually high potential for solar absorber applications (FeS_2). Significant research has been performed on bulk crystals of these materials but little has been done on thin films, despite the obvious potential for heterostructured systems due to their diverse functionality and intrinsic epitaxial compatibility. In this work we report on the wide applicability of reactive sputtering from metallic targets in an Ar/H_2S gas environment as a reliable deposition method. Via detailed characterization of crystal structure, microstructure, and electronic, magnetic, and optical properties, we demonstrate successful deposition of a wide variety of single phase polycrystalline thin films with bulk-like properties. A brief survey of optimized growth conditions, resulting physical properties, and general trends based on metal reactivity, will be presented. We argue that this method holds great promise for the synthesis of a novel family of all-sulfide-based heterostructured devices. Work funded by NSF MRSEC and UMN IREE.

Mike Manno
University of Minnesota - Twin Cities

Date submitted: 29 Nov 2011 Electronic form version 1.4