Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

IV-VI monochalcogenide SnSe nanostructures: synthesis, doping and thermoelectric properties[1] SHUHAO LIU, Case Western Reserve University, NAIKUN SUN, Shenyang Ligong University, SUKRIT SUCHARITAKUL, Case Western Reserve University, MEI LIU, Shandong Normal University, XUAN GAO, Case Western Reserve University — Recently IV-VI monochalcogenide SnSe or SnS has been proposed as a promising two-dimensional (2D) material for valleytronics and thermoelectrics. Despite much theoretical interest and many experimental reports on the thermoelectric characterizations of SnSe single crystal, experimental studies on SnSe in the nanostructured form are still limited. We report the synthesis of SnSe nanoflakes and thin films with chemical vapor deposition (CVD) and their thermoelectric properties. As grown SnSe nanostructures are found to be intrinsically p-type and different types of dopants (In, Pb and Ag) were explored to control the carrier density. We will present the electrical transport property of SnSe nanoflake field effect transistor devices and the effects of doping on the electrical conductivity, Seebeck coefficient, power factor and anisotropy in SnSe films. By doping, the power factor of SnSe films can be improved by at least one order of magnitude compared to the "intrinsic" as grown materials. Our work provides an initial step in the pursuit of IV-VI monochalcogenides as novel 2D semiconductors for electronics and thermoelectrics.

[1]The authors acknowledge NSF grant DMR-1151534 for financial support.

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Date submitted: 10 Nov 2016 Electronic form version 1.4