Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Controlled growth, growth mechanism, and device applications of two-dimensional WSe2 BILU LIU, CHONGWU ZHOU, University of Southern California — Atomically thin 2D transition metal dichalcogenides have attracted lots of attention recently. Here we will present our progress on the controlled growth of 2D WSe2. Vapor phase methods for the growth of large single crystalline WSe2 with lateral sizes up to tens of micrometers will be discussed. Substrate atomic-step-guided nucleation and growth of aligned WSe2 on single crystalline sapphire substrate will also be presented. In addition, by reducing the supply of source materials, we observed a novel screw-dislocation-driven growth of 2D few layer and pyramid-like WSe2 flakes. Then, we will discuss device applications of CVD WSe2. We show that the device characteristics of CVD WSe2 can be tuned into either p-type or ambipolar behavior, by changing the types of contact metals. We further developed an efficient method to convert as-grown semiconducting 2H-phase WSe2 into metallic 1T-phase WSe2, by controlled reacting with n-butyl lithium (n-BuLi). By using metallic WSe2 as contact regimes and intact semiconducting WSe2 as channel regimes, we successfully made ohmic contacted WSe2 transistors and achieved a hole mobility of 66 cm2/V.s and on/off ratio of 10ˆ7 for monolayer CVD WSe2.

Bilu Liu
University of Southern California

Date submitted: 29 Oct 2015 Electronic form version 1.4