

ABSTRACT FOR CONVOCATION PROCEEDINGS:

Growing 2D Transition Metal Dichalcogenides

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Monolayer transition metal dichalcogenides (TMDs) are three atom thick materials that are ideal candidates for electronic and optoelectronic devices such as photodetectors and light emitting diodes. TMDs are also unique for their electronic properties including the large excitonic effect, indirect-to direct bandgap transition, piezoelectricity, and valleytronics. Metal-organic chemical vapor deposition (MOCVD) is on the forefront in producing high-quality large scale TMDs. The focus of this project was to develop reproducible MOCVD recipes for uniform monolayer tungsten disulfide (WS_2) and tungsten diselenide (WSe_2). To achieve this goal I optimized the growth conditions including growth temperature, flow rates of the precursors, and growth time. Optical microscopy (OM), scanning electron microscopy (SEM), and Raman spectroscopy were used to characterize the TMDs (e.g. grain size and formation of multilayers). Currently a reproducible recipe has been developed for synthesizing continuous films of monolayer WS_2 with a grain size of ~ 10 μm , while the recipe for WSe_2 is still under development.