Growth and characterization of some 2D TMD films

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One of the most promising classes of 2D materials is the transition metal dichalcogenides (TMDs) with chemical formula MX_2, where M is a transition metal atom and X is a chalcogen atom. Unique physical phenomenon confining the charge transport and heat in a unique layered structure, which are not easily observed or measured in the related bulk crystal, has endowed them an attractive and promising 2D material for electronic, optoelectronic, and spintronic applications. The transition of an indirect bandgap to a direct bandgap, when bulk materials are scaled down to monolayers, is accompanied by the quantum confinement and surface effects resulting in unique electrical and optical properties of 2D TMDs. Reproducible fabrication of large-area highly crystalline films is, however, still a challenge. Here, we report the fabrication of some few layer TMD films ($PtSe_2$, MoS_2, $MoTe_2$) using one-zone selenization of pre-sputtered metal layers. We have studied the influence of the growth conditions on the structural and electrical properties of the films.