Growth and Structural Characterization of Single Layer Dichalcogenide MoS$_2$

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Synthesis of novel two dimensional materials has gained tremendous attention recently as they are considered as alternative materials for replacing graphene that suffers from a lack of bandgap, a property that is essential for many applications. Single layer molybdenum disulfide (MoS$_2$) has a direct bandgap (1.8eV) that is promising for use in next-generation optoelectronics and energy harvesting devices. We have successfully grown high quality single layer MoS$_2$ by a facile vapor-solid transport route. As-grown single layer MoS$_2$ was carefully characterized by using X-ray diffraction, Raman spectroscopy, field emission scanning electron microscopy and electrical transport measurement. The results indicate that a high quality single layer MoS$_2$ can be successfully grown on silicon substrate. This may open up great opportunities for the exploration of novel nanoelectronic devices.

Keywords: MoS$_2$, Two-dimensional single layer