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Effect of the sample mounting geometry on the grain size of single-crystalline transition-metal dichalcogenide monolayers grown by chemical vapor deposition ZHENG YANG, BO HSU, University of Illinois at Chicago, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING TEAM — In this presentation, it is reported that the local pressure near the surface of the substrate plays a significant role affecting the single crystal grain size of two-dimensional (2D) transition-metal dichalcogenide MX_2 (M=Mo, W; X=S, Se) monolayers in addition to other regular growth parameters such as growth chamber pressure, temperature, and gas flow rates etc during the chemical vapor deposition growth. Different sample mounting geometries (such as substrate facing up, facing down, sandwiching) and vapor trapping techniques (such as vapor trapping tube) to introduce qualitatively various local pressure have been employed in the growth to systematically study this effect. The grain size, optical, and electrical properties of 2D MX_2 monolayer samples grown at different local pressures are compared. It is observed that the enhanced local pressure facilitates larger single crystal grain size and higher quality of the 2D MX_2 monolayers. The size of the single-crystalline MX_2 monolayers achieved by this method were comparable to the literature reported largest size.

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