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Molybdenum disulfide grown by gas-phase precursor hydrogen sulfide in MOCVD ZIHAN YAO, SUNPHIL KIM, AREND VAN DER ZANDE, WENJUAN ZHU, Univ of Illinois - Urbana — In this work, we demonstrate molybdenum disulfide (MoS_2) growth using a new gas-phase precursor hydrogen sulfide in a metal-organic chemical vapor deposition (MOCVD) system, where the flow rate and partial pressure of the gas-phase hydrogen sulfide can be precisely controlled and the gas precursors can be evenly distributed in the growth chamber. The Raman and photoluminescence spectra of the synthesized MOCVD MoS_2 indicate that the film is monolayer. We also systematically investigate the impact of the growth conditions on the morphology of the MoS_2 grown by CVD using solid sulfur powder and by MOCVD using hydrogen sulfide. In CVD MoS_2, the grain size and the layer thickness of CVD MoS_2 increase as the carrier gas flow rate and growth time increase. In MOCVD MoS_2, the shapes of the MoS_2 grains are highly influenced by the flow rate of the gas precursor and the chamber pressure. This work is the first demonstration of MOCVD MoS_2 growth using hydrogen sulfide gas precursor. This new technique can lead to large-scale uniform growth of MoS_2 and provide a solid material foundation for future nanoelectronics.

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