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Synthesis Single Layer Transition Metal Dichalcogenides with Chemical Vapor Deposition YI-HSIEN LI, HAN WANG, LILI YU, WENJING FANG, TOMAS PALACIOS, Massachusetts Institute of Technology, LAIN-JONG LI, Institute of Atomic and Molecular Sciences, Academia Sinica, JING KONG, Massachusetts Institute of Technology — Recently, monolayers of layered transition metal dichalcogenides (LTMD), such as MX2 (M=Mo, W and X=S, Se), have been reported to exhibit significant spin-valley coupling and optoelectronic performances because of the unique structural symmetry and band structures. Monolayers in this class of materials offered a burgeoning field in fundamental physics, energy harvesting, electronics and optoelectronics. However, most studies to date are hindered with great challenges on the synthesis and transfer of high quality LTMD monolayers. Hence, a feasible synthetic process to overcome the challenges is essential. Here, we demonstrate the growth of high-quality MS2 (M=Mo, W) monolayers using ambient-pressure-chemical-vapor-deposition (APCVD) with the seeding of aromatic molecules. Electronic transport and optical performances of the as-grown MS2 monolayers are comparable to those of exfoliated MS2 monolayers. The growth of MS2 monolayer is achieved on various surfaces. Growth mechanism on the novel synthetic process is investigated. Understanding and better control of seeds for the novel growth on the class of materials may stimulate the progress in the emerging filed.

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