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Zinc doping of large-area MoS2 films via chemical vapor deposition[1] ENZHI XU, HAOMING LIU, Indiana Univ - Bloomington, KYUNGWHA PARK, Virginia Tech , ZHEN LI, YAROSLAV LOSOVYJ, MATTHEW STARR, MADILYNN WERBIANSKYJ, HERBERT FERTIG, SHIXIONG ZHANG, Indiana Univ - Bloomington — Atomically thin molybdenum disulfide (MoS2) has attracted significant attention because of its great potential for electronic and optoelectronic applications. Undoped MoS2 is n-type presumably due to the formation of native defects, and realizing p-type conduction has often turned out to be challenging. In this work, we report on the synthesis and characterizations of large-area Zn-doped MoS2 thin films in which the zinc dopant is demonstrated to be p-type. The films were grown by chemical vapor deposition and are monolayers or bilayers with a lateral dimension on the order of millimeters. The p-type nature of Zn dopants was evidenced by the suppression of n-type conduction and a downward shift of the Fermi level with doping. Density-functional-theory calculations were carried out to demonstrate the stability of the Zn dopants and to determine the impurity states. A p-type gate transfer characteristic was observed after the Zn-MoS2 film was thermally annealed in a sulfur atmosphere.

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