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Single-Crystal Growth and Optical Characterization of Large-Area Monolayer WS_2 TING YU, Nanyang Technological University, Singapore — Nowadays, two-dimensional (2D) transition metal dichalcogenides (TMDs) have caused a great deal of interest in view of their unique properties and potential novel applications. Beyond graphene, monolayers of WS_2 with a direct band gap are attracting for developing 2D field-effect transistor and visible light-emitting devices. Till now, controllable synthesis of high-quality single-crystal WS_2 monolayer is still very challenging but highly demanded. In this study, we have successfully grown large-area single-crystal monolayer WS_2 by use of a modified chemical vapor deposition system. Particularly, the photoluminescence (PL) of WS_2 has been investigated. Valley-selective circular dichroism and intense red emission demonstrate high quality of as-grown WS_2 monolayers. Besides, uniform and non-uniform PL distributions over various samples were analyzed to identify the intrinsic emission characters. The PL weakening and its blue shift are attributed to the as-grown structural defects and the defect-induced n-doping. The present work paves the pathway to prepare large-scale single-crystal 2D TMDs and highlights the promising optical performance of WS_2 for future optoelectronics.

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