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Large-area growth of molybdenum disulphide monolayers for integrated photonics[1] Y. JIA, T. STANEV, E. LENFERINK, N.P. STERN, Department of Physics and Astronomy, Northwestern University — Electronic devices based on single/few-layer transition-metal dichacogenide semiconductors heavily rely on mechanically exfoliated micro-flakes. Uncontrollable position and dimension are significant obstacles to integration of electronics and photonics using these layered two-dimensional materials. In this report, we grow continuous few-layer MoS_2 film on SiO_2/Si wafers using a cost-effective solution process and thermal decomposition. The number of the layers can be controlled by the spin-coating rate of the solution. Multi-layers can be controllably reduced layer-by-layer using an Ar-plasma etch. Compared with chemical vapor depositions which usually require temperature of 600-900 C, the low temperature of 450 C used here offers more flexibility in MoS_2 direct growth on other materials such as flexible plastic substrates. The good crystalline quality over area of 50×50 μm^2 and the controlled layer thickness enable broad applications of 2D semiconductor films to realizing integrated photonic devices.

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