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Vapor-Solid Growth of WSe_2 Monolayers and Lateral Heterostructures GENEVIEVE CLARK, PASQUAL RIVERA, SANFENG WU, CHUNMING HWANG, GRANT AIVAZIAN, DAVID COBDEN, XIAODONG XU, University of Washington — Monolayer transition metal dichalcogenides (TMDCs) are atomically thin direct-gap semiconductors that show a variety of novel electronic and optical properties such as valley-polarization of Bloch electrons, due to their symmetry and two-dimensional nature. Heterostructures and devices combining various TMDCs via vertical or lateral stacking have shown further promise for applications in nanoelectronics and nano-optics, however the need for exfoliated samples limits the investigation of such materials and devices. Here, we present the synthesis of WSe_2 monolayers and lateral WSe_2-$MoSe_2$ heterostructures on insulating substrates using a catalyst-free physical vapor deposition method. Monolayers and heterostructures up to 15 microns in size show high optical quality, demonstrated by a high degree of valley-polarization observed via low temperature polarization-resolved photoluminescence measurements.

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