

Orientation domain dispersions in wafer scale epitaxial monolayer WSe_2 on sapphire

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Project Summary: Azimuthal reflection high-energy electron diffraction (ARHEED) is demonstrated as a powerful technique to measure the symmetry, lattice constants and in-plane orientation domain dispersion in wafer-scale, continuous monolayer WSe_2 epitaxially grown on c-plane sapphire by metalorganic chemical vapor deposition. The constructed 2D reciprocal map from ARHEED reveals a few degrees' dispersion in the 60° WSe_2 orientation domains which is attributed to step meandering/bunching of the sapphire substrate. Minor 30° orientation domains are also observed. The angular domain dispersion accompanying the growth of finite domain size can be minimized by controlling the step structure of the sapphire substrate to reduce step meandering/bunching. Published in: *Appl. Surf. Sci.* 2021, 567, 150798.

2DCC Role: The wafer-scale WSe_2 monolayer film on sapphire analyzed in this study was grown by MOCVD in the 2DCC-MIP Thin Films facility.

