

Growth of van der Waals materials on reactive substrates

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In order to integrate van der Waals (vdW) materials with existing optoelectronic device structures, they must be grown at a wafer-scale on traditional semiconductor substrates. However, most semiconductor materials have surface dangling bonds that must be passivated prior to growth of vdW materials. In addition, semiconductor substrates frequently have anisotropic surface energies, which can lead to a variety of unusual morphologies. In this talk, I will describe our efforts to grow bismuth chalcogenides on GaAs (001) substrates. I will demonstrate the growth of nanocolumns, show control over film orientation, explain droplet epitaxy, and give a recipe for how to grow high-quality vdW films on semiconductor substrates.