Understanding and controlling of semiconductor nanostructures for next-generation electronic devices

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Semiconductor nanomaterials provide exciting properties for high performance devices for diverse applications such as energy conversion, optoelectronics, and sensors. Precise control of nanostructure and geometry is required to achieve and maneuver their properties into desired applications. To this end, we aim to understand and control semiconductor nanostructures and their physical properties. This talk presents our two recent examples of the control of semiconductor nanomaterials by chemical vapor deposition (CVD) methods – i.e., 2D transition metal dichalcogenides (TMDs) monolayer and 1D perovskite nanowires. We show a strong correlation between TMDs morphology and growth environment. Specifically, by tuning H2 concentration dynamically, we observe controllable formation of monolayer TMDs on the substrate. In addition, we observe the dynamic process of the conversion of metal halide nanowires grown by VLS method into hybrid perovskite nanowire structure. These results ultimately provide the insights to control the nanostructures for broad photonic and electronic applications.