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In-house Research and External User Project - 2018

Epitaxial growth of large area WSe_2 monolayers by gas source chemical vapor deposition

Zhang, Choudhury, Chubarov, Jariwala, Zhang, Alem, Robinson, Redwing, (Penn State); Xiang, Wang, (RPI)

Monolayer 2D transition metal dichalcogenides (TMDs) have been a focus of increasing interest due to their unique properties but the development of device technologies has been hampered by difficulties in synthesizing large area monolayer and few layer films. We developed a multi-step process involving nucleation, ripening and preferential lateral growth to achieve epitaxial WSe_2 monolayers on sapphire by gas source chemical vapor deposition. This process enables control of the nucleation density of WSe_2 on the sapphire and the lateral growth rate of domains resulting in coalescence of monolayer regions over wafer-scale areas with minimal multilayer growth. The process also provides insights into the fundamental kinetic and thermodynamic factors that impact monolayer growth.

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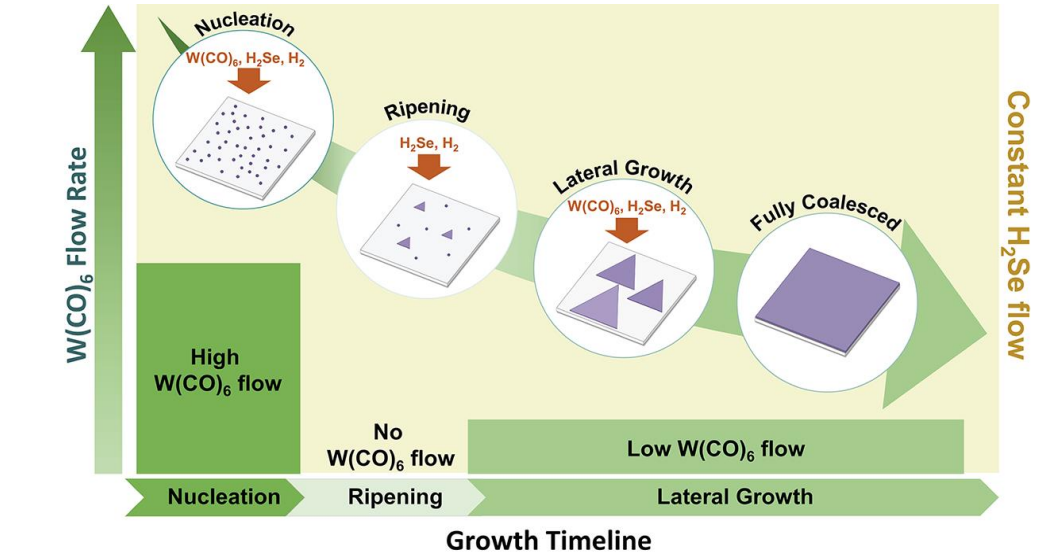

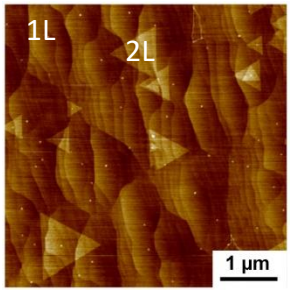

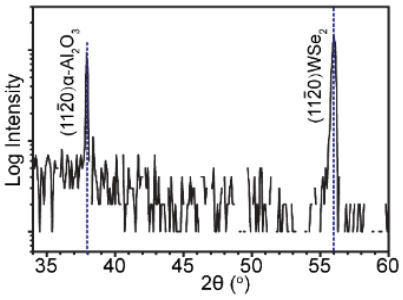

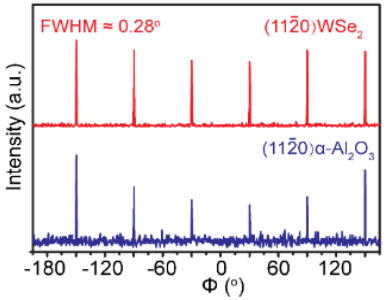

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