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Emergent electronic states in chalcogenide/oxide heterostructures

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Realizing novel electronic states in two-dimensional chalcogenides, complex oxides, and their heterostructures, which result from the reduced dimensionality and interfacial interactions with the nearby substrate, is of great interest from both fundamental and technological perspectives. Molecular beam epitaxy (MBE) is one of the most advanced synthesis techniques for the growth of materials with atomic-scale precision. AT UBC, we employ a dual-MBE system, capable of designing and synthesizing both types of materials and their heterostructures. Material systems showing emergent states will be presented in the talk. For example, enhanced superconductivity has been achieved in monolayer FeSe grown on SrTiO3 substrate. We determine the surface structure of SrTiO3 that is used to achieve superconducting FeSe films in experiments. The existence of a double TiO2 layer helps to transfer electrons to FeSe films, and leads to a band structure characteristic of superconducting samples.

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