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Growth and Characterization of TMDs (MoS_2, $MoSe_2$, WS_2, WSe_2 & $MoTe_2$) and Their Alloys on Various Substrates DAVID BARROSO, ARIANA NGUYEN, SAHAR NAGHIBI, MICHAEL GOMEZ, INGRID LIAO, CHUN-YU HUANG, I-HSI LU, EDWIN PRECIADO, THOMAS EMPANTE, WILLIAM COLEY, DOMINIC MARTINEZ, AIMEE MARTINEZ, Univ of California - Riverside — Transition Metal Dichalcogenides (TMDs) have been of interest over the past years due to their exciting semiconducting properties. In the bulk, TMDs possess a native indirect bandgap and transition to a direct bandgap as they approach the monolayer limit. The bandgaps range from 1.15 eV to 1.95 eV depending on composition. Using organic liquids and/or inorganic powders as precursors, CVD growth has been realized for MX_2 TMDs (M = Mo, W; X = S, Se) and their alloys at tunable compositions. I will present the effect of tuning parameters such as temperature, gas flow, time of heat and hold on the resultant single-layer films. Different precursors can lead to different overall film structures and enable different growth conditions. The films can either be made homogeneous in bandgap or gradients of material/bandgap can be grown. The use of different substrates (dielectric, ferroelectric, piezoelectric, semicoundcing , insulating, patterned) allows an additional degree of freedom and sets the stage for subsequent experiments. I will talk about preparation methods tailored toward direct applicability of surface acoustic spectroscopy, scanning photocurrent microscopy, and ferroelectric gating of the single-layer films.

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