Advances in molecular beam epitaxy of superconducting materials

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After three decades of innovation and development, atomic-layer-by-layer molecular beam epitaxy (ALL-MBE) has risen to prominence as a paramount technique in Materials science and Condensed matter physics, in particular for synthesis of strongly-correlated-electron materials and superconductors. I will describe three different ALL-MBE systems: one that includes a Time-of-flight ion scattering and recoil spectroscopy (TOF-ISARS) system, the second coupled to Angle-Resolved photoemission spectroscopy (ARPES) and Spectroscopic-Imaging Scanning Tunneling Microscopy (SI-STM), and the third connected to a Low-energy electron microscope (LEEM), Low-energy electron diffraction (LEED) and an in-situ magnetic and transport measurements system. Each of these instruments offers some unique research capabilities, and a representative scientific case will be made for each one. Examples will include delta-doping tomography, synthesis of artificial (metastable) materials, STM and ARPES spectra of materials that do not cleave well in vacuum, and movies of growth of new quantum materials.

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