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Integration of functional complex oxides on silicon using molecular beam epitaxy AGHAM POSADAS, MIRI CHOI, RYTIS DARGIS, ALEX DEMKOV, Materials Physics Laboratory, University of Texas at Austin — Complex oxides exhibit a wide range of electronic properties, including high temperature superconductivity, colossal magnetoresistance, metal-insulator transitions, ferromagnetism, and ferroelectricity. Interesting devices and sensors could be envisioned by fabricating these oxides in epitaxial, thin film form on silicon, the most widely used materials platform for electronic devices. However, integrating the functionality of complex oxides onto silicon turns out to be a very difficult problem. One needs to be able to deposit an oxide in crystalline form on top of silicon without forming SiO_2, which grows amorphous and destroys the underlying crystalline order of the substrate surface causing subsequently deposited films to be highly defective. In this talk, we will first describe the new oxide molecular beam epitaxy capabilities at the Materials Physics Laboratory in UT Austin, and then briefly discuss a process by which one can smoothly transition from the oxygen-sensitive, covalently bonded silicon substrate to a fully oxidized, ionically bonded perovskite oxide layer ($SrTiO_3$) using a carefully sequenced deposition of various atomic layers. This capability opens up the possibility of depositing these functional oxide materials in epitaxial form onto silicon.

Agham Posadas
Materials Physics Laboratory, University of Texas at Austin

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