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Sub-monolayer Strontium Phase Diagram on Silicon (100) JAMES REINER, KEVIN GARRITY, FRED WALKER, SOHRAB ISMAIL-BEIGI, C. H. AHN, Yale University — Crystalline oxides manifest a number of important phenomena, including magnetism, ferroelectricity, superconductivity, and colossal magnetoresistance. Recently, it has become possible to integrate these materials onto a silicon platform in a fully epitaxial structure. These crystalline oxide-silicon heterostructures bring the promise of integrating the rich functionality present in crystalline oxides with modern silicon device technology. The most successful fully epitaxial oxide-silicon (100) heterostructures have been achieved through a deposition recipe that involves manipulating substrate temperature and oxygen pressure on a layer by layer basis during the deposition of an alkaline earth metal. Motivated by a desire to develop a fundamental understanding of this important transition layer between silicon and oxide, we have mapped out the phase diagram of strontium on silicon as a function of temperature and coverage. In particular, recent work on sub-monolayer strontium deposition on the silicon surface suggests the conventional picture of this structure, upon which the entire crystalline oxides on silicon framework is built, is only a low-temperature phase which plays no role in enabling epitaxial oxide growth. Instead, there is strong evidence that a different high temperature phase is the crucial template for epitaxial oxide growth on silicon.

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