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Temperature-driven irreversible phase transition of Sr template for epitaxial $SrTiO_3$ growth on vicinal Si (001) KRISTY KORMONDY, AGHAM POSADAS, ALEXANDER DEMKOV, University of Texas at Austin — Strontium titanate (STO) grown epitaxially on silicon has been an area of interest both for its own properties as a high-k dielectric and its capacity to act as a substrate for other crystalline oxides. In this study, we investigate STO growth on a 4° miscut Si (001) surface with double atomic steps to enhance our understanding of submonolayer Sr deposition and STO growth. It is well-known that a half-ML of Sr on the Si surface is a necessary prerequisite for crystalline growth; however, detailed study of reflection high-energy electron diffraction (RHEED) pattern during Sr deposition at various substrate temperatures reveals two distinct surface reconstructions at half-ML coverage. At temperatures below 350°C, the 2x1 pattern is nearly identical to that of clean Si, but as the temperature is increased, we see the irreversible appearance of a 2x spot parallel to the step edge while the 2x spot perpendicular to the step edge dims. We also find that crystalline STO can be grown on both of these high- and low-temperature templates, with identical RHEED and band alignment as determined by XPS, showing that this previously unexplored low-temperature template can provide an alternative route for STO growth on Si.

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