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Ferroelectric Transition in Compressively Strained Epitaxial $\mathbf{SrTiO_3}$[1] AMIT VERMA, Electrical Engineering, Univ. of Notre Dame, SANTOSH RAGHAVAN, SUSANNE STEMMER, Materials Dept., Univ. of California, Santa Barbara, DEBDEEP JENA, Electrical Engineering, Univ. of Notre Dame — Strontium titanate ($SrTiO_3$) is a transition metal oxide semiconductor that crystallizes in the cubic perovskite crystal structure and exhibits incipient ferroelectricity. The dielectric constant of bulk unstrained $SrTiO_3$ crystals saturates at temperatures below 4K while above $\sim$ 50K, its dielectric constant decreases following the Curie-Weiss law of ferroelectricity [Muller et al., Phys. Rev. B 19, 3593 (1979)]. Based on the Landau-Ginzburg-Devonshire theory of ferroelectrics, it is theoretically predicted that under biaxial compressive or tensile strain, $SrTiO_3$ thin films should become ferroelectric [Pertsev et al., Phys. Rev. B 61, R825 (2000)]. Heteroepitaxial growth on lattice-mismatched substrates was used earlier to demonstrate near room temperature in-plane ferroelectricity in tensile strained $SrTiO_3$ thin films [Haeni et al., Nature 430, 758 (2004)]. In this work, we have epitaxially grown compressively strained $SrTiO_3$ thin films on (001) LSAT substrates, fabricated Pt/$SrTiO_3$ Schottky diodes, and performed temperature-dependent capacitance-voltage (CV) measurements of these diodes. As predicted by the theory, the out-of plane dielectric constant of $SrTiO_3$ extracted from these CV measurements shows a divergence, implying a ferroelectric transition in compressively strained $SrTiO_3$.

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