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Electrical characterization of n-$SrTiO_{3-\delta}$ / p-Si(100)epitaxial diode structures[1] RYAN COTTIER, DANIEL CURRIE, NIKOLETA THEODOROPOULOU, Texas State University — Semiconducting, single crystalline n-p (n-STO/p-Si) junctions were grown by MBE (Molecular Beam Epitaxy) using a technique that suppresses the formation of a SiO_2 interfacial layer. The STO layer thickness varied from 3.6 to 30 nm, and oxygen vacancies were induced during growth by controlling the background O_2 pressure (δ up to 0.4%). The STO films are compressively strained by 1.7% due to the lattice mismatch with Si, and strain induced ferroelectric behavior was observed for 4 nm thick films at 300K. The epitaxial quality was verified through x-ray diffraction, atomic force microscopy, scanning electron microscopy and transmission electron microscopy. I-V measurements (5-300K) showed characteristics of an n-p junction down to T=10 K. C-V measurements at 300 K for a frequency range of 1 kHz to 1 MHz show typical depletion layer capacitance behavior for reverse bias. Under forward biased, both V_{bi} and the dielectric constant decrease with increasing thickness. A sharp peak in the capacitance is observed for voltages higher than V_{bi} for frequencies below 10 kHz. The origin of the observed behavior is considered in terms of strain, interface states, charged defects, ferroelectricity, an interfacial dipole, band bending, and an inversion layer at the interface.

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Ryan Cottier
Texas State University

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