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Beyond GaAs: Room-Temperature Intersubband Absorption in $SrTiO_3/LaAlO_3$ Multiple Quantum Wells JOHN ORTMANN, NISH NOOKALA, University of Texas at Austin, QIAN HE, Oak Ridge National Lab, AGHAM POSADAS, University of Texas at Austin, ALBINA BORISEVICH, Oak Ridge National Lab, MIKHAIL BELKIN, ALEX DEMKOV, University of Texas at Austin — With the recent advancements in oxide thin film fabrication, it is possible to design and grow oxide quantum well heterostructures whose well depths far exceed those of traditional GaAs-based quantum wells. Here, we discuss the design, fabrication, structural quality, and optical properties of MBE-grown $SrTiO_3/LaAlO_3$ multiple quantum wells. These oxide quantum wells have a conduction band offset of greater than 2eV, as measured by X-ray photoelectron spectroscopy. We present simulations of the confined states within the wells and demonstrate the feasibility of driving intersubband transitions whose energies exceed 1eV. Furthermore, we demonstrate the excellent crystalline quality of these heterostructures via X-ray diffraction spectra and STEM-HAADF imaging and present evidence of atomic-scale control of the structures. Finally, we present room-temperature FTIR spectra demonstrating the first-reported evidence of intersubband absorption in $SrTiO_3/LaAlO_3$ multiple quantum wells and discuss the possibility of oxide quantum well-based devices.

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