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Optical properties of transition metal oxide quantum wells ALEXANDER DEMKOV, MIRI CHOI, MATTHEW BUTCHER, The University of Texas, CESAR RODRIGUEZ, New Mexico State University, QIAN HE, Oak Ridge National Laboratory, AGHAM POSADAS, The University of Texas, ALBINA BORISEVICH, Oak Ridge National Laboratory, STEFAN ZOLLNER, New Mexico State University, CHUNGWEI LIN, ELLIOTT ORTMANN, The University of Texas — We report on the investigation of $SrTiO_3/LaAlO_3$ quantum wells (QWs) grown by molecular beam epitaxy (MBE) on $LaAlO_3$ substrate. Structures with different QW thicknesses ranging from two to ten unit cells were grown and characterized using x-ray photoemission spectroscopy, reflection high-energy electron diffraction (RHEED), scanning transmission electron microscopy (STEM). Optical properties (complex dielectric function) were measured by spectroscopic ellipsometry (SE) in the range of 1.0 eV to 6.0 eV at room temperature. We observed that the absorption edge was blue-shifted by approximately 0.39 eV as the STO quantum well thickness was reduced to two unit cells (uc). Density functional theory and tight-binding are used to model the optical response of these heterostructures. Our results demonstrate that the energy level of the first sub-band can be controlled by the QW thickness in a complex oxide material. We acknowledge support from Air Force Office of Scientific Research (FA9550-12-10494).

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