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The effect of epitaxial strain and R^{3+} magnetism on interfaces between $RAlO_3$ and $SrTiO_3$ MARK C. MONTI, SHIRIN MOZAFFARI, JOHN T. MARKERT, Department of Physics, The University of Texas at Austin — We have embarked on a systematic study of novel charge states at oxide interfaces. We have performed pulsed laser deposition (PLD) growth of epitaxial oxide thin films on single crystal oxide substrates. We are studying the effects of epitaxial strain and rare-earth composition of the metal oxide thin films. We have successfully created TiO_2 terminated $SrTiO_3$ (STO) substrates and have grown epitaxial thin films of $LaAlO_3$ (LAO), $LaGaO_3$ (LGO), and $EuAlO_3$ (EAO) on STO using a KrF pulsed excimer laser. Current work emphasizes the importance of understanding the effect of both epitaxial strain and R^{3+} magnetism on the interface between $RAlO_3$ and STO. We have demonstrated that the interfaces between LAO/STO and LGO/STO are metallic with carrier concentrations of 1.1 x 10^{14} cm^{-2} and 4.5 x 10^{14} cm^{-2}, respectively. Surprisingly, we find that even good epitaxial interfaces between EAO/STO are insulating. We will investigate the effect of strain by growing $La_xY_{1-x}AlO_3$ on STO: for example $La_{0.4}Y_{0.6}AlO_3$ mimics the lattice size of EAO. We will systematically vary the magnetism of the $RAlO_3$ thin films for R = Ce, Pr, Nd, Sm, Eu, Gd, Tb, La_xEu_{1-x}, ect. This work was supported by: Texas Advanced Research Program 003658-0126, The Robert A. Welch Foundation F-1191, and the National Science Foundation DMR-0605828.

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