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Electrical transport of La-doped $SrTiO_3$ films on silicon ERIC JIN, CHARLES AHN, FREDERICK WALKER, Yale Univ — The integration of complex oxides such as $SrTiO_3$ (STO) onto silicon using molecular beam epitaxy (MBE) allows one to combine the multifunctional properties of oxide heterostructures with traditional semiconductor platforms. It has been shown that STO can support high 2D carrier densities from either cation doping (i.e. $La_xSr_{1-x}TiO_3$ – LSTO) or as a 2D electron gas at an interface. One current challenge is that the room temperature mobility is low and limited by phonon scattering. One approach to improve the mobility of the STO/Si interface is to increase the conduction band offset between the oxide and the silicon by changing the amount of oxygen at the oxide-semiconductor interface. We measure the electrical transport of films grown on Si by MBE and show that as-grown films exhibit multiple channels of conduction from Hall measurements. We show that by increasing the oxygen content in the film by growth in a plasma, we can increase the conduction band offset of STO/Si as measured by x-ray photoemission, and consequently observe a limited increase in the density of electrons in the Si. While the achievable density is small, this approach demonstrates the tunability of band offsets in oxide-semiconductor systems in order to control electron distribution and mobility for device applications.

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