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A metal-insulator transition tunable by lattice deformation in $LaTiO_3$ thin films FRANKLIN WONG, University of California, Berkeley, SEUNG-HYUB BAEK, HO WON JANG, University of Wisconsin, Madison, RAJESH CHOPDEKAR, VIRAT MEHTA, University of California, Berkeley, CHANG-BEOM EOM, University of Wisconsin, Madison, YURI SUZUKI, University of California, Berkeley — Strong electron-electron and electron-lattice correlations play critical roles in electronic transitions of complex oxides. Since $LaTiO_3$ is a narrow bandgap Mott insulator on the verge of a metal-insulator transition, substrate-induced lattice distortions offer a route to tuning its electronic properties. We have observed metallic to insulating behavior in $LaTiO_3$ films depending on choice of (001) substrates: $SrTiO_3$, LSAT, and $LaAlO_3$. Tetragonal distortions induced by epitaxial in-plane compression from the $SrTiO_3$ substrates result in metallicity in $LaTiO_3$ films, while films on LSAT substrates exhibit a range of electronic properties depending on the degree of lattice relaxation. Whereas thinner $LaTiO_3$ films on LSAT exhibit "semimetallic" behavior, in thicker films, the out-of-plane lattice parameters surprisingly converge to values greater than the bulk lattice constant, and the films become more insulating. We will discuss the profound consequences thin-film lattice deformation has on electrical transport. We speculate that stabilization of lattice distortions via epitaxy may open a new avenue for materials engineering of oxides through careful control of structural perturbations.

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