Electronic structure, Fermi surfaces, and electron-phonon coupling in La-doped Sr$_2$TiO$_4$ and SrTiO$_3$\textsuperscript{1} Yuefeng Nie, Shouvik Chatterjee, Bulat BurGANov, Eric Monkman, John HarTER, Daniel Shai, Laboratory of Atomic and Solid State Physics, Department of Physics, Cornell University, Ithaca, NY 14853, USA, Che-Hui Lee, Darrell SchloM, Department of Materials Science and Engineering, Cornell University, Ithaca, New York 14853, USA, Kyle Shen, Laboratory of Atomic and Solid State Physics, Department of Physics, Cornell University, Ithaca, NY 14853, USA — Sr$_2$TiO$_4$ is a quasi-two-dimensional Ruddlesden-Popper structure analogue to SrTiO$_3$, and is isostructural with the cuprate parent compound La$_2$CuO$_4$. Although the electronic structure of SrTiO$_3$ has been well-explored due to its importance in oxide electronics, little is known about the electronic properties of Sr$_2$TiO$_4$. To investigate this, we synthesized epitaxial La doped Sr$_2$TiO$_4$ and SrTiO$_3$ films on (100) LSAT substrates by molecular beam epitaxy (MBE) and investigated the electronic structure using angle-resolved photoemission spectroscopy (ARPES). The electronic structure of 5% La doped Sr$_2$TiO$_4$ shows a single electron like band with mostly Ti-3d$_{xy}$ character dispersing across the Fermi surface which corresponds well with LDA calculations. This is in contrast to doped SrTiO$_3$ where all three t$_{2g}$ bands are degenerate. We also observed signatures of strong electron-phonon coupling in the quasi-two-dimensional Sr$_2$TiO$_4$ materials which appear to be absent in three-dimensional SrTiO$_3$.

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