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Screening of the electron-phonon interaction in STO ALEXAN-
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tanate is a bulk insulator that becomes superconducting at remarkably low car-
rier densities. Even more enigmatic properties become apparent at the strontium
titanate/lanthanum aluminate (STO/LAO) interface and it is important to dis-
entangle the effects of reduced dimensionality from the poorly-understood pairing
mechanism. Recent experiments\(^1\) measuring the electronic structure of the anal-
ogous strontium titanate surface have found a cross-over as a function of carrier
density from a series well-resolved phonon replica bands to a single quasiparticle
dispersion, with the crossover occurring at densities that correspond to the disap-
pearance of superconductivity in the STO/LAO system. We interpret these results
in a simple analytical model that extends an Engelsberg-Schrieffer theory of elec-
trons coupled to a single longitudinal optic phonon mode to include the effects of
electronic screening. As the carrier density increases, the effective dielectric func-
tion cuts off the long-range phonon interaction beyond the Thomas-Fermi screening
length, eventually leaving only a uniform short-range coupling to the phonon bath.
We additionally incorporate the effects of carrier density on the static dielectric
properties of the interface.

\(^1\)Z. Wang et al, arXiv:1506.01191

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