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Electronic Structure of Epitaxial Thin Films of the Transparent Conducting Oxide La:$BaSnO_3$ Measured By In-Situ Angle-Resolved Photoemission Spectroscopy EDWARD LOCHOCKI, HANJONG PAIK, Cornell University, MASAKI UCHIDA, University of Tokyo, DARRELL SCHLOM, KYLE SHEN, Cornell University — Lanthanum-doped barium stannate (La:$BaSnO_3$) is a transparent conducting oxide where single crystals have exhibited unusually high mobility and oxygen stability. Here we present in-situ angle-resolved photoemission (ARPES) measurements of La:$BaSnO_3$ epitaxial films that were co-deposited onto lattice-matched rare-earth scandate substrates by molecular-beam epitaxy (MBE). Density functional theory (DFT) calculations agree well with the observed valence bands and predict a parabolic conduction band. However, the features observed near the Fermi energy (E_F) are non-dispersive yet localized in momentum space. This unusual appearance may be the result of quasi-localized charge carriers or out-of-plane momentum broadening. Over long measurement periods, we also observe changes to the valence band and near-E_F feature that bear a strong resemblance to the beam-induced two-dimensional electron gases previously reported in $SrTiO_3$ and $KTaO_3$. The origin of these unexpected phenomena and their relationship to the structural and transport properties of these films will be discussed.

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