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Evolution of the Electronic Structure of n-Type $BaSnO_3$ Films With Chemical Doping and Photodoping 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 well known for its high mobility and its ability to host a surface electron gas. Here we present angle-resolved photoemission (ARPES) measurements of La:$BaSnO_3$ thin films deposited on scandate substrates by molecular beam epitaxy. Increased bulk La content is found to reduce the surface carrier concentration via Fermi level pinning, in contrast to other n-type transparent conducting oxides. Subsequent ARPES measurements made over the course of hours show that photogenerated electron-hole pairs reduce the upward band bending, providing persistent but reversible surface photodoping. Chemical doping and photodoping both induce spectral changes typically associated with oxygen vacancy formation or electronic correlations, even though $BaSnO_3$ exhibits extreme oxygen stability and its valence and conduction bands have no d character. These results establish $BaSnO_3$ as a unique transparent conductor and demonstrate its potential for understanding the broader class of perovskite oxide materials.

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