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Metal-insulator transition in doped iridates $Sr_3Ir_2O_7$ WENWEN ZHOU, Boston College, YOSHINORI OKADA, WPI-AIMR, Tohoku University, CHETAN DHITAL, TOM HOGAN, ILIJA ZELJKOVIC, DANIEL WALKUP, Boston College, HSIN LIN, National University of Singapore, TAY-RONG CHANG, National Tsing Hua University, ARUN BANSIL, Northeastern University, ZIQIANG WANG, STEPHEN WILSON, VIDYA MADHAVAN, Boston College — Bilayer perovskite iridate $Sr_3Ir_2O_7$ (Ir327) is a spin-orbit Mott insulator with a small charge gap, and as such provides an ideal playground for exploring carrier-induced metal-insulator transition (MIT). In particular, site-dependent introduction of carriers is proposed to lead to vastly different effects on this transition. To probe this, we use scanning tunneling spectroscopy (STS) to spatially map out the local density of states of Ir327 doped via two distinct routes: Ru-doped Ir327 ($Sr_3(Ir_{1-x}Ru_x)_2O_7$) with in-plane, and La-doped Ir327 ($(Sr_{1-x}La_x)_3Ir_2O_7$) with out-of-plane carriers. We find that in-plane Ru doping leads to MIT at x $\sim$ 35 %, while out-of-plane La doping shows homogeneous metallic phase, even with dilute La concentration of a few percent, indicating a different MIT mechanism arising from the site-dependent doping process. Our STS data, combined with transport and neutron scattering results, offer potential routes to obtaining metallic states as well as novel phases from the parent insulating states in iridates.

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