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Heteroepitaxially lifting Diracdegeneracy in topological semimetallic perovskite $SrIrO_3$ JIAN LIU, University of Tennessee - Knoxville — Crystal symmetry-breaking and time-reversal symmetry breaking in epitaxial thin films and heterostructures of the topological semimetallic perovskite $SrIrO_3$ were investigated by experimental growth, characterizations and theoretical calculations. Structure refinement on ultrathin films and first-principles calculations show that the symmetry-protected Dirac line nodes in the topological semimetallic perovskite $SrIrO_3$ can be lifted simply by applying epitaxial constraints. In particular, the Dirac nodal ring is found to be gapped in epitaxial film structure where the n-glide symmetry of the bulk Pbnm space group is removed while the mirror symmetry is preserved. Our symmetry-breaking analysis shows that the n-glide operation protects the nodal ring and the b-glide operation provides addition protection for a pair of high-symmetry Dirac points of the nodal ring. These symmetry operations can be selectively broken by different epitaxially strained structures, leading to different semimetallic band crossing. Time-reversal symmetry is further investigated under epitaxial confinement by ferromagnetic $La_{0.7}Sr_{0.3}MnO_3$. The resulted control over the magnetic anisotropy and spin-orbit coupling will be discussed. The results highlight the vital role of symmetry in spin-orbit-coupled correlated oxides.

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