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Experimental bandstructure of the $5d$ transition metal oxide IrO_2

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In the $5d$ iridium oxides the close energy scales of spin-orbit coupling and electron-electron correlations lead to emergent quantum phenomena. Much research has focused on the ternary iridium oxides, e.g. the Ruddlesden-Poppers $A_{n+1}B_nO_{3n+1}$, which exhibit behavior from metal to antiferromagnetic insulator ground states, share common features with the cuprates, and may host a number of topological phases. The binary rutile IrO_2 is another important $5d$ oxide, which has technological importance for spintronics due to its large spin Hall effect and also applications in catalysis. IrO_2 is expected to share similar physics as its perovskite-based cousins; however, due to bond-length distortions of the IrO_6 octahedra in the rutile structure, the extent of similarities remains an open question. Here we use angle-resolved photoemission spectroscopy to perform momentum-resolved measurements of the electronic structure of IrO_2. IrO_2 thin films were grown by molecular beam epitaxy on TiO_2 (110) substrates using an Ir e-beam source and distilled ozone. Films were subsequently transferred through ultrahigh vacuum to a connected ARPES system. Combined with first-principles calculations we explore the interplay of spin-orbit coupling and correlations in IrO_2.

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