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(G*) Theoretical study of strain and superconductivity in Sr2IrO4

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Several parallels can be drawn between the perovskite iridate Sr_2IrO_4, and the high Tc cuprates. Although the low energy spectrum of Sr_2IrO_4 includes the three t_{2g} bands, strong spin-orbit coupling splits the bands such that one can write an effective one-orbital J=1/2 model, in analogy with the single orbital of the cuprates. This has led to predictions of d-wave superconductivity in Sr_2IrO_4 upon electron doping. A three-orbital Hubbard model finds that the pairing is dependent on the interorbital interactions, therefore, an effective one orbital model may be insufficient in describing the superconducting state. In this work we investigate the multiorbital properties of Sr_2IrO_4, both with and without doping, under compressive epitaxial strain. Strain modifies lattice constants and bond orientations. The strain is modeled by modifying the orbital dependent hopping amplitudes and can therefore tune the bandwidths of the different bands. By applying a multiple order parameter, self-consistent mean-field approach we study the magnetic structure and pairing symmetry of Sr_2IrO_4 under strain and carrier doping. We comment on ways to increase the chance of superconductivity.

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