

## Dynamics of bulk electron-doped $\text{Sr}_2\text{IrO}_4$

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In this talk I will discuss our recent progress in investigating the low-energy excitations in parent and bulk electron doped  $\text{Sr}_2\text{IrO}_4$  using Ir  $L_3$ -edge RIXS. Surface electron doped  $\text{Sr}_2\text{IrO}_4$  has recently attracted attention as the two salient features of the cuprates fermiology, Fermi arcs evolving into a d-wave gap at lower temperatures, have been observed in ARPES [1, 2] and STM [3] measurements, indicating d-wave superconductivity. However, these encouraging results have not yet materialized in bulk doped samples (e.g. substitution of Sr by La), possibly due to the dopant distortion suppressing the coherent motion of doped electrons and/or lack of carriers [4, 5]. In this context, it is important to gain insight into how bulk electron doping alters the properties of  $\text{Sr}_2\text{IrO}_4$ . We have used complimentary Raman scattering measurements to carefully select high-quality single crystals of  $\text{Sr}_{2-x}\text{La}_x\text{IrO}_4$  ( $0 < x < 0.08$ ) for our RIXS measurements, spanning similar doping range as in Ref. 1. We find that increasing the La content results in (i) a sharp transition from a long- to a short-range magnetic order, (ii) followed by a collapse of a magnon gap, and (iii) a sizable reduction of magnon lifetime. Furthermore, unlike in the case of Rh-doped  $\text{Sr}_2\text{IrO}_4$  (hole-doped) [6] the magnon dispersion is unchanged and persistent collective spin-flip excitation (paramagnons) are observed, resembling results in hole-doped cuprates (LSCO and YBCO) [7, 8]. Additionally, a resonant phonon feature is observed in all samples, indicating substantial electron-phonon coupling in  $\text{Sr}_2\text{IrO}_4$ .

### References

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