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Angle Resolved PhotoEmission Spectroscopy (ARPES) Study of Sr₄Ru₃O₁₀

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Abstract content
 (Max 300 words)

Strontium ruthenates of the Ruddlesden-Popper (R-P) series $\text{Sr}_{n+1}\text{Ru}_n\text{O}_{3n+1}$ have been subject to intensive research since they exhibit distinct collective physical phenomena that are due to the change of the number n of the RuO_6 octahedra layers in the unit cell. The phenomena observed range from unconventional spin-triplet superconductivity in Sr_2RuO_4 ($n=1$) [1], quantum critical metamagnetism in $\text{Sr}_3\text{Ru}_2\text{O}_7$ ($n=2$) [2]; and anisotropic ferromagnetism and proposed orbital-dependent metamagnetism in $\text{Sr}_4\text{Ru}_3\text{O}_{10}$ ($n=3$) [3].

Little is known in literature about the microscopic origin of the metamagnetic transition in $\text{Sr}_4\text{Ru}_3\text{O}_{10}$. Previous experimental and theoretical work on $\text{Sr}_3\text{Ru}_2\text{O}_7$ ($n=2$) have suggested a band structure-based model of metamagnetism to explain its phase diagram [4]. According to this model, it is expected to find van Hove singularities in the density of states near the Fermi level. The same scenario is expected to be valid for $\text{Sr}_4\text{Ru}_3\text{O}_{10}$. Experimental information on the near Fermi level electronic structure of $\text{Sr}_4\text{Ru}_3\text{O}_{10}$ is thus needed to investigate the origin of magnetic fluctuations in $\text{Sr}_4\text{Ru}_3\text{O}_{10}$.

We will show the first electronic structure measurements on $\text{Sr}_4\text{Ru}_3\text{O}_{10}$ using Angle Resolved PhotoEmission Spectroscopy (ARPES). In particular, the near Fermi level band dispersion and the Fermi surface topology of $\text{Sr}_4\text{Ru}_3\text{O}_{10}$ will be presented. The presence of strong electron-phonon correlations in our data, observed through kinks and renormalization of bands, will also be discussed. The presence of kinks in band dispersion is evidence of a sensitive coupling between the structural and magnetic properties in $\text{Sr}_4\text{Ru}_3\text{O}_{10}$ [5]. Finally, we will show band dispersions which reveal a complex density of states that is susceptible to give rise to van Hove singularities near the Fermi level, a situation expected to be the origin of the magnetic fluctuations in $\text{Sr}_4\text{Ru}_3\text{O}_{10}$.

References

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