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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 Srn+1RunO3n+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 RuO6 octahedra layers in the unit cell. The phenomena observed range from unconventional spin-triplet superconductivity in Sr2RuO4 (n=1) [1], quantum critical metamagnetism in Sr3Ru2O7 (n=2) [2]; and anisotropic ferromagnetism and proposed orbital-dependent metamagnetism in Sr4Ru3O10 (n=3) [3].

Little is known in literature about the microscopic origin of the metamagnetic transition in Sr4Ru3O10. Previous experimental and theoretical work on Sr3Ru2O7 (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 Sr4Ru3O10. Experimental information on the near Fermi level electronic structure of Sr4Ru3O10 is thus needed to investigate the origin of magnetic fluctuations in Sr4Ru3O10.

We will show the first electronic structure measurements on Sr4Ru3O10 using Angle Resolved PhotoEmission Spectroscopy (ARPES). In particular, the near Fermi level band dispersion and the Fermi surface topology of Sr4Ru3O10 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 Sr4Ru3O10 [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 Sr4Ru3O10.

References

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Dr. Bryan Patrick Doyle
bpdoyle@uj.ac.za
University of Johannesburg

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Primary author: Mr NGABONZIZA, Prosper (University of Johannesburg)

Co-authors: Dr VECCHIONE, Antonio (CNR-SPIN, I-84084 Fisciano, and Dipartimento di Fisica "E.R. Caianiello", Universita' degli Studi di Salerno, Via Ponte don Melillo I-84084 Fisciano, Italy); Dr CARLESCHI, Emanuela (University of Johannesburg); Dr CUOCO, Mario (CNR-SPIN, I-84084 Fisciano, and Dipartimento di Fisica "E.R. Caianiello", Universita' degli Studi di Salerno, Via Ponte don Melillo I-84084 Fisciano, Italy); Dr DOYLE, Patrick Bryan (University of Johannesburg); Dr FITTIPALDI, Rosalba (CNR-SPIN, I-84084 Fisciano, and Dipartimento di Fisica "E.R. Caianiello", Universita' degli Studi di Salerno, Via Ponte don Melillo I-84084 Fisciano, Italy); Dr BORISENKO, Sergey (Leibniz Institute for Solid State and Materials Research Dresden, Germany); Dr GRANATA, Veronica (CNR-SPIN, I-84084 Fisciano, and Dipartimento di Fisica "E.R. Caianiello", Universita' degli Studi di Salerno, Via Ponte don Melillo I-84084 Fisciano, Italy); Dr ZABOLOTNYY, Volodymyr (Leibniz Institute for Solid State and Materials Research Dresden, Germany)

Presenter: Mr NGABONZIZA, Prosper (University of Johannesburg)

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