Abstract No.: Ding0491

Quasiparticle lineshape of Sr2RuO4 by ARPES

H.B. Yang, S.C. Wang, A. Kumar P.S., H. Ding (Boston College), P. Johnson, T. Valla (BNL)

Beamline(s): U13UB

Introduction: The single layered ruthenate, Sr_2RuO_4 (Sr214), has generated new interest since the discovery of superconductivity with (T_c~ 1*K*) [1]. It is the only non-cuprate perovskite superconductor that is isostructural to the high-T_c cuprate $La_{2-x}Sr_xCuO_4$. However, Sr214 has different electronic and magnetic properties from cuprates. The superconducting state of Sr214 is believed to have *p*-wave symmetry with possible enhanced ferromagnetic correlations. In contrast, cuprates have a *d*-wave order parameter with proximity to antiferromagnetic ordering. The normal state of Sr214 is also interesting. While the in-plane resistivity ρ_{ab} is always metallic, the *c*-axis resistivity ρ_c is non-metallic above T_M ~ 130*K*, and becomes metallic below T_M [2]. Below 25*K*, both ρ_{ab} and ρ_c have Fermi liquid (FL) T^2 behavior, although with a large anisotropy of ~ 600 [2]. In comparison, most cuprates have non-FL transport. Moreover, ρ_c in cuprates remains incoherent down to T_c in most cases, implying that the cuprates are two dimensional in terms of coherent single-particle transport [3]. Therefore, the 2D-3D crossover in Sr214 may shed light on the influence of two-dimensionality on superconductivity. It is well known that charge transport is closely related to the quasiparticle (QP) scattering rate (inverse lifetime), and angle-resolved photoelectron spectroscopy (ARPES) is an ideal technique to probe the QP lifetime in 2D anisotropic electron systems. Therefore, we have proposed and performed high-resolution ARPES on single crystal Sr214 at NSLS.

Methods and Materials: ARPES on single crystal Sr214

References:

[1] Y. Maeno, H. Hashimoto, K. Yoshida, S. Nishizaki, T. Fujita, J.G. Bednorz, and F. Lichtenberg, "Superconductivity in a layered perovskite without copper", Nature **372**, 532 (1994).

[2] Y. Maeno, S. Nishizaki, K. Yoshida, S. Ikeda, and T. Fujita, J. Low Temp. Phys. **105**, 1577 (1996).

[3] P.W. Anderson, "The Theory of Superconductivity in the High-T_c Cuprates", Princeton University Press, Princeton, 1997.