Contribution ID: **244** Type: **poster**

Angle-resolved photoemission study of Fe-based high temperature superconductors

Thursday, 19 September 2013 12:30 (2 hours)

We use high-resolution angle resolved photoemission spectroscopy to study the electronic structure of Fe-based high temperature superconductors. We find that the substitution of Ru for Fe is isoelectronic, i. e., it does not change the carrier concentration. More interestingly, there are no measured significant changes in the shape of the Fermi surface (FS) or in the Fermi velocity over a wide range of Ru substitution ($0 < x < 0.4$).[1] This unusual behavior is in contrast with the case of Co substitution, where even small amount of Co induces large change not only in the size of the FS pockets but also in the FS topology, i. e., Lifshitz transition which is closely linked to the superconducting dome.[2] Given that
the suppression of the anti-ferromagnetic and structural transition temperature is associated with the induction of the superconducting state, Ru substitution must achieve this via a mechanism that
does not involve changes of the Fermi surface. We speculate that this mechanism relies on magnetic dilution that leads to the reduction of the effective Stoner enhancement. Furthermore, we reveal that the band structure of pure and Ru substituted BaFe2As2 changes significantly with sample temperature. The hole and electron pockets are well nested at low temperature, which likely drives the spin density wave and resulting anti-ferromagnetic order. The size of the hole pocket shrinks and the electron pocket expands upon warming, i. e. the nesting is degraded at higher temperatures. These results demonstrate that the temperature dependent nesting may play an important role in
driving the anti-ferromagnetic/paramagnetic phase transition.[3]

[1] R. S. Dhaka et al., Phys. Rev. Lett., 107, 267002 (2011).
[2] Chang Liu et al., Nature Physics 6, 419 (2010); Phys. Rev. B, 84, 020509(R) (2011).
[3] R. S. Dhaka et al., Phys. Rev. Lett., 110, 067002 (2013).

Primary author: Dr DHAKA, R. S. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA; Present Address: Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland)

Co-authors: Dr THALER, A. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Prof. KAMINSKI, Adam (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Prof. HARMON, B. N. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Dr LIU, Chang (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Dr RAZZOLI, E. (Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland); Dr SHI, Ming (Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland); Prof. CANFIELD, P. C. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Mr JIANG, Rui (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Dr HAHN, S. E. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA); Dr BUD'KO, S. L. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA)

Presenter: Dr DHAKA, R. S. (Division of Materials Science and Engineering, The Ames Laboratory, US DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011, USA; Present Address: Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland)

Session Classification: Poster session II and lunch