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Magnetic fluctuations induced insulator-to-metal transition in $\mathbf{Ca(Ir_xRu_{1-x})O_3}$ DEEPAK SINGH, JAGATH GUNASEKERA, ASHUTOSH DAHAL, University of Missouri, Columbia, LELAND HARRIGER, National Institute of Standards and Technology, Gaithersburg, THOMAS HEITMANN, University of Missouri Research Reactor, Columbia — The Fermi liquid theory dictates the metal-insulator transition in a continuous fashion via the divergence of the quasiparticle mass m*. However, the metallic phase near the Mott insulator in the metal-insulator phase diagram based on the Hubbard model is dominated by the fluctuations of spin, charge and orbital correlations; often termed as the anomalous metallic phase. In this presentation, experimental results manifesting the magnetic fluctuations induced insulator-to-metal transition in $Ca(Ir_xRu_{1-x})O_3$ will be discussed in the framework of the Hubbard model. For x = 1, the compound $CaIrO_3$ is a Mott insulator with antiferromagnetic order below T $\sim$ 110 K. A gradual substitution of Ir by Ru results in the onset of anomalous metallic behavior as a function of the tuning parameter x. At x = 0, the compound $CaRuO_3$ is a non-Fermi liquid metal with no apparent magnetic order. While the orthorhombic structural integrity is maintained throughout the group, strong magnetic fluctuations is detected below x = 0.8. The role of magnetic fluctuations in the metallic transition is further confirmed by first principle theoretical calculation.

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