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Microscopic Evidence for Slater-Type Metal-Insulator Transition in Sr_2IrO_4[1] MINGHU PAN, QING LI, Oak Ridge National Laboratory, G.-X. CAO, University of Tennessee, Knoxville, SATOSHI OKAMOTO, G. ZHENG, WENZHI LIN, BRIAN C. SALES, Oak Ridge National Laboratory, J.Y. YI, J.-Q. YAN, University of Tennessee, Knoxville, R. ARITA, University of Tokyo, J. KUNES, Institute of Physics, Czech Republic, M. IMADA, University of Tokyo, D. MANDRUS, University of Tennessee, Knoxville — The interplay between spin-orbit coupling, bandwidth and on-site coulomb repulsion in layered 5d transition metal oxides (TMO) acquired much interest recently. In Sr_2IrO_4, the interplay opens a gap near the Fermi energy and stabilizes a J_{eff} =1/2 spin-orbital entangled insulating state at low temperatures. However, whether this metal-insulating transition (MIT) is Mott-type (electronic-correlation driven) or slater-type (magnetic order driven) is still under hot debate. In this presentation, we give, for the first time, the atomic resolved structure of Sr_2IrO_4 surface in real space by using scanning tunneling microscopy. Tunneling spectroscopic results illustrate the gap opening of Sr_2IrO_4 at low temperatures with the gap size of 250 mV, indicating the metal to insulator transition. More importantly, the pair of peaks around gap in spectra suggests the quasi-particle coherent excitation, implying the Slater-type insulating state. This is further confirmed by temperature dependent measurements and density functional theory calculations.

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