Spin-Orbit Mott State in the Novel Quasi-2D Antiferromagnet Ba_2IrO_4

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Recent extensive studies on the electronic state in Sr_2IrO_4 have revealed that a novel Mott insulating state can be realized by Coulomb interaction in cooperation with large spin-orbit interaction in the $5d$ system. It is proposed that the unconventional $J_{\rm eff} = 1/2$ magnetic ground state originating from the strong spin-orbit coupling is realized in the Mott state.[1]
In this presentation, we report on electronic and magnetic states in the spin-orbit Mott insulator Ba_2IrO_4, which is a new compound recently found by us. Ba_2IrO_4 crystallizes in a K_2NiF_4-type structure including IrO_2 square planar lattices with straight Ir-O-Ir bonds. The magnetic susceptibility and μSR studies revealed that the magnetic ground state is antiferromagnetic long-range order ($T_{\rm N} \sim 240$ K) in which the magnetic moment ($\sim 0.34\ \mu_{\rm B}$/Ir-atom) is significantly reduced by a low-dimensional quantum spin fluctuation with a large intra-plane correlation $|J|$. The behavior is similar to those in parent materials of high-$T_{\rm C}$ cuprate superconductors such as La_2CuO_4.

[1]B. J. Kim et al, Phys. Rev. Lett. **101**, 076402 (2008), Science **323**, 1329 (2009).