Substitution effect of Ir oxide with K$_2$NiF$_4$ type structure
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— The ground state of Sr$_2$IrO$_4$ with the K$_2$NiF$_4$ –type structure is the Mott insulator generated by the competition between the strong spin-orbit coupling (SOC, $\sim$0.5eV) and weak Coulomb interaction ($U$, $\sim$0.5eV). The crystal structure of Sr$_2$IrO$_4$ consists of stacked two dimensional (2D) IrO$_2$ layers with canted antiferromagnetic order ($T_N = 250$K) and SrO layer, similar to the high-$T_c$ cuprate La$_2$CuO$_4$. We have investigated the substitution effect for Sr$_2$IrO$_4$ to confirm the influence of band filling control of Mott insulating state. We synthesized the hole doping sample of Sr$_{2-x}$K$_x$IrO$_4$ and electron doping sample of Sr$_{2-x}$La$_x$IrO$_4$. From the magnetic susceptibility data, the absolute magnetic moment of Sr$_{2-x}$La$_x$IrO$_4$ decreases with increasing La concentration $x$ (However, $T_N$ value is almost constant, being independent of $x$). The electrical resistivity data of Sr$_{2-x}$M$_x$IrO$_4$ ($M = K, La$) systematically decreases with increasing $x$. These facts indicate that we succeeded in effective carrier doping to IrO$_2$ layer and suggest that the ground state is gradually changed toward to metallic state.