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Possible Superconductivity Induced by Strong Spin-Orbit Coupling in Carrier Doped Iridium Oxides Insulators KAZUTAKA NISHIGUCHI, RIKEN, CREST , TOMONORI SHIRAKAWA, RIKEN, RIKEN AICS, CREST , HIROSHI WATANABE, RIKEN CEMS, CREST, RYOTARO ARITA, Department of Applied Physics, The University of Tokyo, PRESTO , SEIJI YUNOKI, RIKEN, RIKEN CEMS, RIKEN AICS, CREST — $5d$ transition metal oxide Sr_2IrO_4 and its relevant Iridium oxides have attracted much interest because of exotic properties arising from highly entangled spin and orbital degrees of freedom due to strong spin-orbit coupling (SOC). Sr_2IrO_4 crystalizes in the layered perovskite structure, similar to cuprates. Five $5d$ electrons in Ir occupy its t_{2g} orbitals which are split by strong SOC, locally inducing an effective total angular momentum $J_{\rm eff} = 1/2$, analogous to a $S = 1/2$ state in cuprates. Because of the similarities to cuprates, the possibility of superconductivity (SC) in Iridium oxides has been expected theoretically once mobile carriers are introduced into the $J_{\rm eff} = 1/2$ antiferromagnetic insulator [1]. To study theoretically possible SC in carrier doped Sr_2IrO_4, we investigate a three-orbital Hubbard model with SOC. By solving the Eliashberg equation in the random phase approximation, we find that $J_{\rm eff} = 1/2$ antiferromagnetic fluctuations favor $d_{x^2-y^2}$-wave SC with a mixture of singlet and triplet Cooper pairings. We will also discuss the particle-hole asymmetry of the SC induced by electron and hole doping. [1] H. Watanabe, et. al., Phys. Rev. Lett. **110**, 027002 (2013)

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