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Doping a Spin-Orbit Mott Insulator: Topological Superconductivity from the Kitaev-Heisenberg Model and Possible Application to (Na_2/Li_2)IrO_3 YI-ZHUANG YOU, Institute for Advanced Study, Tsinghua University, Beijing, China, ITAMAR KIM-CHI, ASHVIN VISHWANATH, Department of Physics, University of California, Berkeley, CA, USA — We study the effects of doping a Mott insulator on the honeycomb lattice where spins interact via direction dependent Kitaev couplings J_{K}, and weak antiferromagnetic Heisenberg couplings J. This model is known to have a spin liquid ground state and may potentially be realized in correlated insulators with strong spin orbit coupling. The effect of hole doping is studied within a t-J-J_{K} model, treated using the SU(2) slave boson formulation, which correctly captures the parent spin liquid. We find superconductor ground states with spin triplet pairing that spontaneously break time reversal symmetry. Interestingly, the pairing is qualitatively different at low and high dopings, and undergoes a first order transition with doping. At high dopings, it is smoothly connected to a paired state of electrons propagating with the underlying free particle dispersion. However, at low dopings the dispersion is strongly influenced by the magnetic exchange, and is entirely different from the free particle band structure. Here the superconductivity is fully gapped and topological, analogous to spin polarized electrons with $p_x + ip_y$ pairing. These results may be relevant to honeycomb lattice iridates such as A_2IrO_3 (A = Li or Na) on doping.

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