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Nodeless and Topological Superconductivity of Doped Mott insulator in Proximity to Antiferromagnets GUO-YI ZHU, Tsinghua University, ZIQIANG WANG, Boston Collegeon, GUANG-MING ZHANG, Tsinghua University, and Collaborative Innovation Center of Quantum — Motivated by the recent experimental observations of nodeless superconductivity in high-Tc copper oxides, we investigate the proximity effect of anti-ferromagnets adjacent to doped Mott insulator. By performing slave Boson mean-field treatment to t-J model with external staggered magnetic field, we identified the evolution of the pairing symmetries from d-wave to s-wave with growing staggered magnetization. Even more, we found transition from nodal to nodeless d-wave when Fermi-surface is suppressed by staggered magnetization, and the same mechanism also applies to transition from nodal to nodeless s-wave phase. At the intermediate regime between pure d-wave and s-wave, the system is dominated by s+id pairing symmetry instead, which is also divided into two phases (s+id)w for weak pairing and (s+id)s for strong pairing, depending on the presence of Fermi-surface. What's more interesting is that the (s+id)w phase with Fermi-surface is topologically nontrivial and shows robust gapless edge modes protected by valley symmetry. These findings strongly suggest that doped Mott insulator in proximity to anti-ferromagnets can produce fully gapped superconductivity with various pairing symmetries and potentially realize the topological valley superconductor.

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