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Topological superconducting states with magnetic moments on a conventional s-wave superconductor SHO NAKOSAI, UTokyo, YUKIO TANAKA, Nagoya Univ., NAOTO NAGAOSA, RIKEN CEMS, UTokyo — The search for topological properties in superconductors has been one of the most highlighted topics in nearly a decade. Especially Majorana fermions, appearing as topologically protected boundary modes associated with nontrivial features of superconductors, provide a promising platform for quantum computations. Therefore there is a real need for designing adapted superconductivity with ordinary materials. In this talk, we will present theoretical calculations on unconventional superconductivity induced by the magnetic moments in a conventional spin-singlet s-wave superconductor [1]. By choosing the spin directions of these moments, one can design spinless pairing states appearing within the s-wave superconducting energy gap. It is found that the helix spins produce a $p_x + p_y$-wave state while the skyrmion crystal configuration a $p_x + ip_y$-wave-like state. Nodes in the energy gap and the zero-energy flat band of Majorana edge states exist in the former case, while the chiral Majorana channels along edges of the sample and the zero-energy Majorana bound state at the core of the vortex appear in the latter case.

[1] Sho Nakosai, Yukio Tanaka, and Naoto Nagaosa, PRB 88, 180503(R) (2013)

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