凝縮系物理学ゼミナール

Condensed Matter Seminar

(※ seminar is held online via zoom)

Date: **13:30-15:00**, Wednesday, 17 June 2020

“Multiple odd-parity superconducting phases in bilayer transition metal dichalcogenides”

Speaker:

Shota Kanasugi (Condensed Matter Theory Group)

Abstract:

Searching for spin-triplet superconductors has been one of central issues in condensed matter physics. Previous studies have revealed that two important factors for stabilizing spin-triplet pairing states are ferromagnetic (FM) spin fluctuation and disconnected Fermi surface structure [1]. On the other hand, it has been elucidated that locally noncentrosymmetric (NCS) crystal structure leads to various exotic superconducting (SC) phenomena such as parity-mixed SC states [2], pair-density-wave stares [3], and topological superconductivity [4].

Considering the above-mentioned aspects, we study unconventional superconductivity in a two-dimensional locally NCS triangular lattice model [5], which is relevant to bilayer TMDs such as bilayer MoS_2 [6]. The SC instability is analyzed by solving the Eliashberg equation within the random phase approximation. We show dominance of FM fluctuations owing to the existence of disconnected Fermi surfaces near type-II van Hove singularity [7], which is a fingerprint of bilayer structure. In the absence of spin-orbit coupling (SOC), we find that odd-parity spin-triplet *f*-wave SC state is stabilized by the FM fluctuation. Furthermore, we investigate impacts of the layer-dependent staggered Rashba and Zeeman SOC originated from the locally NCS crystal structure. Multiple odd-parity SC phase diagrams are obtained as a function of the staggered SOC and Coulomb interaction. Especially, a topological chiral *p*-wave SC state is stabilized by the Zeeman SOC of a realistic magnitude. Our results suggest multiple odd-parity superconductivity ubiquitous in bilayer TMDs.

References:

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