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Physics of Surface Andreev bound states

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Abstract:

An overview will be presented of the physics of surface Andreev bound states in superconducting junctions up to now[1-2].

- (1)Introduction and Andreev reflection
- (2)Surface Andreev bound states (SABS) in unconventional superconductors
Tunneling effect and Josephson effect
- (3)Topological invariant and SABS (2D)
- (4)Example of non-centrosymmetric superconductor
- (5)Topological invariant and SABS (3D)
- (6)Topological superconductivity without using unconventional pairing.
1D edge, 2D edge, with and without time reversal symmetry
- (7)Topological superconductivity in doped topological insulator & semimetal.

Starting from the history of Andreev bound state, I will mention about the progress during 20 years. I emphasize that 1)high T_c cuprate can be regarded as topological superconductor, 2)Majorana fermion is regarded as special type of surface Andreev bound state.

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[2] S. Kashiwaya and Y. Tanaka, Rep. Prog. Phys. 63, 1641 (2000).

[3] Y. Tanaka, M. Sato and N. Nagaosa, J. Phys. Soc. Jpn. 81 011013 (2012) .

[4] K. Yada, M. Sato, Y. Tanaka and T. Yokoyama, Phys. Rev. B 83 064505 (2011).

[3] M. Sato, Y. Tanaka, K. Yada, T. Yokoyama, Phys. Rev. B 83, 224511 (2011) .

[4] S. Tamura, S. Kobayashi, Lu Bo and Y. Tanaka, Phys. Rev. B 95 104511 (2017).