Topological Nonsymmorphic Crystalline Superconductors

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Topological superconductors possess a superconducting gap in the bulk and gapless zero energy modes, known as “Majorana zero modes”, at the boundary of a finite system. In a crystal, when crystalline symmetry is taken into account, more classes of topological superconductors can exist and are protected by crystalline symmetry. These types of topological superconductors are known as "topological crystalline superconductors". In this talk, I will introduce a new class of topological crystalline superconductors, which are protected by the glide symmetry, one type of nonsymmorphic crystalline symmetry, and thus dubbed “topological nonsymmorphic crystalline superconductors”. For a space group, glide symmetry is a symmetry operation that is a combination of mirror symmetry and non-primitive translation. Compared to mirror symmetry, additional phase factor can be introduced to the eigen wave function of a non-symmorphic crystal due to the non-primitive translation. We will show that this fact will lead to the classification of topological nonsymmorphic crystalline superconductors different from topological mirror superconductors. We construct an explicit Bogoliubov-de Gennes type of model for this topological superconducting phase in the D class of Altland-Zirnbauer classification and show explicitly that Majorana zero modes in this model are protected by glide symmetry. We will also discuss topological non-symmorphic superconductors in other symmetry classes.

Ref.

[1] Topological Nonsymmorphic crystalline superconductors, Qing-Ze Wang and Chao-Xing Liu, arxiv: 1506.07938 (2015).

[2] Topological non-symmorphic crystalline insulators, Chao-Xing Liu, Rui-Xing Zhang, and Brian K. VanLeeuwen, Phys. Rev. B 90, 085304 (2014).