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Classification of topological crystalline superconducting nodes on high-symmetry axis

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Recent development in exact classification of a superconducting gap has elucidated various unconventional gap structures [1-8], which have not been predicted by the classification of order parameter based on the point group [9]. One of the important previous results is that all symmetry-protected line nodes are characterized by nontrivial topological numbers [6, 7]. Another intriguing discovery is the gap structures depending on the angular momentum of electrons j_z on threefold and sixfold rotational-symmetric lines [1, 3, 8]. Stimulated by these findings, we complementarily classify all crystal symmetry-protected nodes on high-symmetry n-fold (n = 2, 3, 4, and 6) axes, by using the combination of group theory and K-theory [10]. As a result, it is shown that the classification by group theory completely corresponds with the topological classification. Based on the obtained results, we discuss superconducting gap structures in several candidate superconductors.

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