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Real-Space Topological Classification: Higher-order topology and Atiyah-Hirzebruch spectral sequence

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In recent years, a lot of concepts that relate the crystalline symmetries to topology have been proposed. Among them, the complete classification of topological crystalline insulators is a fundamental unsolved problem. Although such materials are known to be classified by twisted equivariant K-theory, computation of it is still a difficult task in general.

In this talk, I introduce the recent developments of computing the topological classification based on the Atiyah-Hirzebruch spectral sequence (AHSS) [1]. First I briefly explain the basics of K-theoretical classification under Altland-Zirnbauer symmetries, which behave as the onsite symmetries in real space. Then I will explain the AHSS of the topological crystalline phases constructed from onsite-symmetric building blocks. In our formalism, all procedures are performed in real space instead of momentum space, which is conventionally used. As a result, classification of higher-order topological insulators are naturally given by a by-product introduced in AHSS in addition to the K-theory itself.

[1] N. Okuma, M. Sato, and K. Shiozaki, arXiv:1810.12601

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