Emerging Weyl Point in a ferroelectric

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After a discover of topology in condensed matter physics, tremendous research has been worked to find topological material in electronic system which Dirac point or Weyl point is inherited. The interest has not been restricted in Fermionic system but extended to Bosonic system spontaneously for its exotic potential in application.

While Dirac states are required to have time reversal symmetry (TRS) and inversion symmetry (I) simultaneously, Weyl points are required not to respect one of them. As phonon is a bosonic particle, TRS is always be protected whereas inversion symmetry would be replaced by other crystalline symmetries. Based on a data driven discovery work in topological phononic material with crystalline symmetry analysis, it could be noted that materials with topological phonon would be easily found. Interestingly, however, ferroelectric material deserves to have further attention due to its external controllability and we find nonsymmorphic ferreoelctric materials could be provocative for its usage in memory industry.

Utilizing nonsymmorphic symmetry in ferroelectric materials, it is expected to facilitate topological states possessing Weyl points in ferroelectric, which is attractive candidate in memory device industry [1]. We also present strain engineering to maximally activate topological states.

[1] H.J.Lee et al., Science 369 (2020), 1343.