3D anomalous quantum Hall effect in hyperhoneycomb lattices[1]

SANG WOOK KIM, KANGJUN SEO, XU DOU, BRUNO UCHOA, Univ of Oklahoma — The hyperhoneycomb lattice is an example of a larger class of three dimensional structures with planar trigonally connected sites. The tight binding model of the hyperhoneycomb lattice has electronic quasiparticles around a closed nodal line, called a Dirac loop. For spineless fermions, we address the 3D anomalous quantum Hall (AQH) effect, which is expected to emerge in the corresponding lattice model through a quantum phase transition in the presence of interactions. We derive the 3D quantum Hall conductance due to surface states, and calculate a non-trivial dissipationless Hall viscosity due to elastic deformations of the lattice in the AQH regime.

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