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Phonon-Induced Topological Transition to a Type-II Weyl Semimetal[1] LIN-LIN WANG, Ames Laboratory, NA HYUN JO, YUN WU, Dept. of Physics and Astronomy, Iowa State University, ADAM KAMINSKI, PAUL C. CANFIELD, Ames Laboratory, Dept. of Physics and Astronomy, Iowa State University, DUANE D. JOHNSON, Ames Laboratory, Dept. of Physics and Astronomy, Dept. of Materials Science and Engineering, Iowa State University, Ames, IA 50011
— The emergence of topological quantum states requires certain combinations of crystalline symmetry with or without time reversal symmetry. Without restricting to searches for crystal structures with non-symmorphic symmetry operations in the space groups, we have studied the interplay between crystal symmetry, atomic displacements (lattice vibration), band degeneracy and topology. For a system with a full gap opening between the two band manifolds near the Fermi energy, we show that small atomic displacements (accessible via optical phonons near room temperature) can lower the symmetry to induce type-II Weyl points at the boundary between a pair of closely-lying electron and hole pockets.

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