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Quantum Spin Liquids in Hyperhoneycomb Lattices: Classifications and Applications to Pressurized β -Li₂IrO₃ BIAO HUANG, Univ of Pittsburgh, YONG BAEK KIM, University of Toronto, YUAN-MING LU, The Ohio State University — Recent discoveries of frustrated magnets in various honeycomb-based lattices with strong spin-orbit couplings have drawn much attention, due to their proximity to a quantum spin liquid phase captured by the Kitaev model. Though magnetic orders have been identified in most compounds from this family, recent experiments suggested a symmetric spin liquid ground state in β -Li₂IrO₃ under pressure, with no signatures of a finite temperature phase transition. Motivated by this experimental discovery, we systematically classify U(1) spin liquids on the hyperhoneycomb lattice, and study their properties using the slave fermion representation. The U(1) spin liquids in the neighborhood of the Kitaev Z_2 spin liquid are identified, which bridges the experimental observation and previous theoretical studies. We discuss the key features and energetics for various U(1) and Z_2 states, and identify the promising candidates for the spin liquid ground state in pressurized β -Li₂IrO₃.

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