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Topological spin liquids in the ruby lattice with anisotropic Kitaev interactions SAEED S. JAHROMI, Department of Physics, Sharif University of Technology, Tehran, Iran, MEHDI KARGARIAN, Department of Physics, University of Maryland, College Park, MD 20742, ABDOLLAH LANGARI, Department of Physics, Sharif University of Technology, Tehran, Iran — The ruby lattice is a four-valent lattice interpolating between honeycomb and triangular lattices. In this work we investigate the topological spin-liquid phases of a spin Hamiltonian with Kitaev interactions on the ruby lattice using exact diagonalization and perturbative methods. The latter interactions combined with the structure of the lattice yield a model with $Z_2 \times Z_2$ gauge symmetry. We mapped out the phase diagram of the model and found gapped and gapless spin-liquid phases. While the low-energy sector of the gapped phase corresponds to the well-known topological color code model on a honeycomb lattice, the low-energy sector of the gapless phases is described by an effective spin model with three-body interactions on a triangular lattice. A gap is opened in the spectrum in small magnetic fields, where we showed that the ground state has a finite topological entanglement entropy. We argue that the gapped phases could be possibly described by exotic excitations, and their corresponding spectrum is richer than the Ising phase of the Kitaev model.

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