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Thermodynamics of Ising Spins on the Star Lattice DAO-XIN YAO, ZEWEI CHEN, NVSEN MA, Sun Yat-sen University — There is a new class of two-dimensional magnetic materials polymeric iron (III) acetate fabricated recently in which Fe ions form a star lattice. We study the thermodynamics of Ising spins on the star lattice with exact analytic method and Monte Carlo simulations. Mapping the star lattice to the honeycomb lattice, we obtain the partition function for the system with asymmetric interactions. The free energy, internal energy, specific heat, entropy and susceptibility are presented, which can be used to determine the sign of the interactions in the real materials. Moreover, we find the rich phase diagrams of the system as a function of interactions, temperature and external magnetic field. For frustrated interactions without external field, the ground state is disordered (spin liquid) with residual entropy 1.522 . . . per unit cell. When a weak field is applied, the system enters a ferrimagnetic phase with residual entropy ln4 per unit cell. The arXiv version of this work is arXiv:1210.1675.

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