

Effect of the bond distortion in the Ising-Heisenberg model on the Shastry-Sutherland lattice

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We consider a hybrid version of the distorted Shastry-Sutherland model with the Heisenberg intradimer and Ising interdimer couplings. We focus on the case where the bond distortions of the orthogonal dimers may lead to the different values of the intradimer couplings depending on the bond orientation. Using the unitary transformation [1] the model can be diagonalized and its ground state is found rigorously. We show that in zero magnetic field the bond distortion gives rise to the modulated antiferromagnetic phase previously observed also in the orthogonal-dimer chain, a one-dimensional counterpart of the Shastry-Sutherland model. The effect of the external magnetic field is also studied for the different ratio of the bond distortion. The ground-state phase diagram gains the 1/4-plateau phase in addition to the 1/3- and 1/2- plateaux obtained for the symmetric model [1]. We also show how the distortion suppress the stripe 1/3-plateau phase in favor of the 1/4- and 1/2-plateau phases.

1. T. Verkholyak, J. Strečka, F. Mila, K. P. Schmidt, Phys. Rev. B **90**, 134413 (2014).