MAGNETO-THERMAL PROPERTIES OF THE ISING-HEISENBERG ORTHOGONAL-DIMER CHAIN WITH QUANTUM XXZ-TRIANGLES

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9.7 cm

We consider an exactly solvable model of orthogonal-dimer chain with Ising and Heisenberg bond. Using the modified classical transfer-matrix technique we find exact expression for partition function and, thus, for all thermodynamic functions of the system. We investigate the issue of vast variety of its ground states, especially ones with spontaneous breaking of the translational symmetry. Analyzing ground states properties we obtain several $T = 0$ ground states phase diagrams which correspond to different sets of the parameters. Depending of the values of parameters the system exhibits the magnetization curves with the following transitions between various magnetization plateau $M = 0 \to M = 1$, $M = 0 \to M = 1/2 \to M = 1$, $M = 0 \to M = 1/4 \to M = 1/2 \to M = 1$, $M = 0 \to M = 1/4 \to M = 1$, $M = 1/2 \to M = 1$ and $M = 1/4 \to M = 1/2 \to M = 1$. The general mechanism of unit cell doubling in the lattice models with block structure and left-right asymmetry is discussed. Finally, we present a comparison of the magneto-thermal properties of the underlying purely quantum model (orthogonal-dimer chain with four various couplings) and exactly solvable system with Ising and Heisenberg bonds.

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