Magnetic behavior of the spin-1/2 Ising-Heisenberg model on diamond-dike decorated Bethe lattices in external field

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The Heisenberg model continues to be one of the most intensively studied models in statistical mechanics since it well describes magnetic properties of real materials. In this work, the spin-1/2 Ising-Heisenberg antiferromagnetic model on the diamond-like decorated Bethe lattice in the presence of an external magnetic field is examined by the use of the decoration-iteration mapping transformation and the method of exact recursion relations. An exact relation between partition function of the studied system and that of the standard spin-1/2 Ising model on the corresponding Bethe lattice is obtained using the decoration-iteration transformation. The exact calculations for the Ising and Heisenberg magnetizations are done for arbitrary coordination number of simple Bethe lattice. The low-temperature properties and finite-temperature behaviors of the model on the diamond-like decorated Bethe lattice are investigated in detail. Both sublattice magnetizations of the Ising and Heisenberg spins are exactly calculated with the aim to investigate magnetization process in the external field, thermal dependences of the total and sublattice magnetizations.