

Complete Enumeration Approach for Calculation of Residual Entropy for Diluted Spin Ice

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Abstract : We consider the antiferromagnetic systems of Ising spins located at the sites of the hexagonal, triangular and pyrochlore lattices. Such systems can be diluted to a certain concentration level by randomly replacing the magnetic spins with nonmagnetic ones. Quite recently we studied density of states (DOS) was calculated by the Wang-Landau method. Based on the obtained data, we calculated the dependence of the residual entropy (entropy at a temperature tending to zero) on the dilution concentration for quite large systems (more than 2000 spins). In the current study, we obtained the same data for small systems (less than 20 spins) by a complete search of all possible magnetic configurations and compared the result with the result for large systems. The shape of the curve remains unchanged in both cases, but the specific values of the residual entropy are different because of the finite size effect.

Keywords : entropy, pyrochlore, spin ice, Wang-Landau algorithm

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