Book Review: Statistical Mechanics of Periodic Frustrated Ising Systems


The term frustration, coined by Toulouse some 10 years ago, refers to situations in spin systems whose competing interactions cannot be simultaneously minimized. While the concept of frustration was originally developed in the context of investigations of spin glasses, a wealth of results has been accumulated for systems with periodic frustrations. This book is a review on these latter results for spin-½ Ising systems, including one further section on the random chain problem.

Periodic frustrated systems are analyzed very much in the same way as homogeneous systems. The intended subject matter therefore spans essentially the entire field of the Ising model, and the compact size of this book (142 pages) necessarily makes the presentation mostly a collection of results with little details given. Materials are grouped according to the dimensionality and type of the lattice of the system, an arrangement that makes the book very useful as a reference. Among the few cases with detailed discussions, treatment of the axial-next-nearest-neighbor Ising chain is very nicely done. But estimations of the ground-state degeneracy for the triangular lattice are redundant, since the exact result is also given. The list of (176) references is relatively small and, therefore, hardly complete. Notable omissions include mean-field discussions, other approaches to layered models (by Hahn and co-workers, and by McCoy and co-workers, e.g.), connections with stochastic crystal growth models (by Enting, e.g.) and the Baxter model (by Jüngling, e.g.), and the exact disorder solution of a frustrated simple cubic lattice (by Jaekel and Maillard).

Despite these drawbacks and occasional minor slips (absorption mistaken for adsorption, Ref. 166 duplicates 52, e.g.), this book represents a timely and worthwhile effort in describing the field and, as such, serves as a useful resource for researchers and students.

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