<<平衡态统计物理学>>

图书基本信息

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作者：普利史可

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前言

During the last decade each of the authors has regularly taught a graduate or senior undergraduate course in statistical mechanics. During this same period, the renormalization group approach to critical phenomena, pioneered by K. G. Wilson, greatly altered our approach to condensed matter physics. Since its introduction in the context of phase transitions, the method has found application in many other areas of physics, such as many-body theory, chaos, the conductivity of disordered materials, and fractal structures. So pervasive is its influence that we feel that it now essential that graduate students be introduced at an early stage in their career to the concepts of scaling, universality, fixed points, and renormalization transformations, which were developed in the context of critical phenomena, but are relevant in many other situations.In this book we describe both the traditional methods of statistical mechanics and the newer techniques of the last two decades. Most graduate students are exposed to only one course in statistical physics. We believe that this course should provide a bridge from the typical under-graduate course (usually concerned primarily with noninteracting systems such as ideal gases and paramagnets) to the sophisticated concepts necessary to a researcher.We begin with a short chapter on thermo dynamies and continue, in Chapter 2, with a review of the basics of statistical mechanics. We assume that the student has been exposed previously to the material of these two chapters and thus our treatment is rather concise. We have, however, included a substantial number of exercises that complement the review.In Chapter 3 we begin our discussion of strongly interacting systems with a lengthy exposition of mean field theory. A number of examples are worked out in detail. The more general Landau theory of phase transitions is developed and used to discuss critical points, tricritical points, and first-order phase transitions. The limitations of mean field and Landau theory are described and the role of fluctuations is explored in the framework of the Landan Ginzburg model.

内容概要

During the last decade each of the authors has regularly taught a graduate or senior undergraduate course in statistical mechanics. During this same period, the renormalization group approach to critical phenomena, pioneered by K. G. Wilson, greatly altered our approach to condensed matter physics. Since its introduction in the context of phase transitions, the method has found application in many other areas of physics, such as many-body theory, chaos, the conductivity of disordered materials, and fractal structures. So pervasive is its influence that we feel that it now essential that graduate students be introduced at an early stage in their career to the concepts of scaling,

作者简介

作者：（加拿大）普利史可（Michael Plischke）

书籍目录

章节摘录

插图：The case of melting of two-dimensional crystals is considerably more complicated. We first note that it is important, in physisorbed materials, to distinguish between lattice gases and floating monolayers. An example of a lattice gas (helium adsorbed onto the basal plane of graphite) is discussed in Section 7.5.2. In such a system the adsorbed layer does not have a continuous translational symmetry. To arst approximation, the atoms occupy discrete sites on the substrate and thermal excitation results in hopping of atoms between eligible sites. Such lattice gases have conventional long-range order below the criticalpoint.

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