

<<固体能带理论和电子性质>>

图书基本信息

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## 前言

This book covers the important topic of band theory and electronic properties of materials. It is intended to be used by final-year undergraduates and first-year graduate students studying condensed matter physics as part of a physics or engineering degree. It may also be used as preparatory material for students starting a doctorate in condensed matter physics or semiconductor devices, or for recent graduates starting research in these fields in industry. Why does this book exist?

Yet another book on the electronic properties of solids requires some explanation. In teaching final-year undergraduates and first-year graduate students, I have become frustrated with the scarcity of general texts which cover a wide range of material synoptically. Students at this point in their careers often have to embark on research projects, extended essays, literature searches, and so on, in very diverse topics; they tend to dive straight into a specialised text book covering one particular topic (one-dimensional solids, impurities in semiconductors etc.) and to forget that this topic is part of a wider whole. The outcome can be a blinkered attitude in which connections are missed, wheels are reinvented and so on. Secondly, the old warhorses by Kittel and Ashcroft and Mermin, although fine in many respects, have little connection with the huge explosion of re-search in condensed matter physics over the last 20 years. The leap from many such texts to current research topics is enormous; students, seeing illustrated data from the 1950s and 1960s are often convinced that condensed matter physics is no longer an active, glamorous research field. Thirdly, there is a perceived gap between undergraduate condensed matter physics texts, which often flounder at length in one dimension, concealing the wood with trees, and more advanced books such as Ashcroft and Mermin, which is often rather daunting for undergraduates. I therefore planned a book which would treat band theory and its consequences at a simple level, but in three dimensions from the start, and which would provide pointers to recent developments. The book would give an overview of the field, suggesting literature which provided various routes into current research topics. The task was made easier when the book became part of the wider Oxford Master Series in Condensed Matter Physics, a collection of six linked text-books covering virtually all areas of the subject. Topics, such as superconductivity, which could lead to very lengthy diversions, could therefore be left to someone else, leaving what I hope is a much more focused book.

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### 内容概要

能带理论广泛存在，它是对量子力学最严格的检验之一。

本书自成体系，以定量的、相对严格的方式揭示了能带理论是如何决定材料性质的。

所有这些都需要借助于量子力学才能得以解释。

本书介绍了科技中用到材料的电子、光学和结构性质的概念以及理解这些概念所需要的量子力学的知识，还描述了研究能带结构的一些实验技术。

本书在一定深度上涉及了近些年来的研究热点，并展示了该研究领域持续的活力。

本书适用于物理及工程专业的高年级本科生和低年级研究生。

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### 书籍目录

金属：Drude 模型与Sommerfeld模型周期势场中粒子的量子力学：Bloch定理近自由电子模型紧束缚模型关于能带结构的一些要点半导体与绝缘体能带结构工程能带结构的测量金属和半导体中热量与电流的传递三维体系中的磁阻二维体系中的磁阻与量子Hall效应半导体中非均匀的与热载流子分布A 凝聚态物理学中的实用术语B  $k$ -空间态密度的推导C 分布函数的推导D 声子E 氢原子的Bohr模型F 测量电阻率及Hall效应中的实验考虑G 正则动量H 超导电性I 选用符号列表J 精选习题解答与附加提示索引

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### 编辑推荐

《固体能带理论和电子性质》是系列一册，适用于物理及工程专业的高年级本科生和低年级研究生。

《固体能带理论和电子性质》介绍了物理学的主要领域的知识和相关应用，旨在引导读者进入相关领域的前沿。

丛书坚持深入浅出的写作风格，用丰富的示例、图表、总结加深读者对内容的理解。

书中附有习题供读者练习。

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