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<<超导、超流和凝聚体>>

图书基本信息

书名：<<超导、超流和凝聚体>>

13位ISBN编号：9787030236241

10位ISBN编号：7030236246

出版时间：2009-1

出版时间：科学出版社

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页数：183

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前言

Ever since their original discovery nearly 100 years ago， superconductors andsuperfluids have led to an incredible number of unexpected and surprising newphenomena. The theories which eventually explained superconductivity in met-als and superfluid 4He count among the greatest achievements in theoreticalmany-body physics， and have had profound implications in many other areas， such as in the construction of the "Higgs mechanism" and the standard modelof particle physics. Even now there is no sign that the pace of progress is slowing down. Indeedrecent years have seen renewed interest in the field in following the 1986 discov-ery of cuprate high temperature superconductivity and the 1995 announcementof Bose-Einstein condensation （BEC） in ultra-cold atomic gases. These break-throughs have tremendously widened the scope of the area of "low temperaturephysics" from 165 K （only about -100~~C， a cold day at the North Pole） thehighest confirmed superconducting transition temperature ever recorded， tothe realm of nano-Kelvin in laser trapped condensates of atomic gases. Further-more an incredibly wide range of materials is now known to be superconducting.The field is no longer confined to the study of the metallic elements and theiralloys， but now includes the study of complex oxides， carbon-based materials（such as fullerene C60）， organic conductors， rare earth based compounds （heavyfermion materials）， and materials based on sulphur and boron （MgB2 supercon-ductivity was discovered in 2001 ）. Commercial applications of superconductingtechnology are also increasing， albeit slowly. The LHC ring currently （in 2003）being installed at the CERN particle physics center is possible only becauseof considerable recent advances in superconducting magnet technology. Buteven this uses "traditional" superconducting materials. In principle， even morepowerful magnets could be built using novel high temperature superconductingmaterials， although these materials are difficult to work with and there are manytechnical problems still to be overcome. The goal of this book is to provide a clear and concise first introductionto this subject. It is primarily intended for use by final year undergraduatesand beginning postgraduates， whether in physics， chemistry， or materials sci-ence departments. Hopefully experienced scientists and others will also find itinteresting and useful. For the student， the concepts involved in superfluidity and superconductivitycan be difficult subject to master. It requires the use of many different elementsfrom thermodynamics， electromagnetism， quantum mechanics， and solid statephysics. Theories of superconductivity， such as the Bardeen Cooper Schrieffer（BCS） theory， are also most naturally written in the mathematics of quantumfield theory， a subject which is well beyond the usual undergraduate physicscurriculum. This book attempts to minimize the use of these advanced math-ematical techniques so as to make the subject more accessible to beginners.

内容概要

本书包含三条主线：Bose-Einstein凝聚体(BEC)，超流体和超导电性。
书中首先建立专题的重要概念，然后介绍必要的数学方法。
本书从三个主题中最简单的BEC开始，首先全面回顾了Bose-Einstein理想气体的基础，然后详述了磁捕陷与原子冷却技术和稀化原子气体中的BEC。
4He中的超流性较难理解，因为它是强相互作用量子流体。
本书介绍了超流性的主要物理现象，以及如何从宏观量子相干性与非对角长程序的主要概念得出超流现象。
超导电性的理论分步加以阐述：先讨论较简单的London和GinzbergLandau理论及其主要应用，然后推导量子相干态的数学概念和Bardeen-Cooper-Shrieffer(BCS)理论。
最后一章涉及较高深的话题，包括3He超流和特异超导体中的非常规Cooper对的证据。
本书不需要读者具备量子多体理论的知识，必要的数学概念会在需要处予以介绍。

书籍目录

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编辑推荐

《牛津大学研究生教材系列》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、总结加深读者塒内容的理解。
书中附有习题供读者练习。

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