<<磁性物理学和磁性材料>>

图书基本信息

书名：<<磁性物理学和磁性材料>>

13位ISBN编号：9787510050459

10位ISBN编号：7510050456

出版时间：2013-1

出版时间：世界图书出版公司

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页数：182

前言

The first accounts of magnetism date back to the ancient Greeks who also gave magnetism its name. It derives from Magnesia, a Greek town and province in Asia Minor, the etymological origin of the word "magnet" meaning "the stone from Magnesia." This stone consisted of magnetite (Fe304) and it was known that a piece of iron would become magnetized when rubbed with it. More serious efforts to use the power hidden in magnetic materials were made only much later. For instance, in the 18th century smaller pieces of magnetic materials were combined into a larger magnet body that was found to have quite a substantial lifting power.Progress in magnetism was made after Oersted discovered in 1820 that a magnetic field could be generated with an electric current. Sturgeon successfully used this knowledge to produce the first electromagnet in 1825. Although many famous scientists tackled the phenomenon of magnetism from the theoretical side (Gauss, Maxwell, and Faraday) it is mainly 20th century physicists who must take the credit for giving a proper description of magnetic materials and for laying the foundations of modern technology. Curie and Weiss succeeded in clarifying the phenomenon of spontaneous magnetization and its temperature dependence. The existence of magnetic domains was postulated by Weiss to explain how a material could be magnetized and nevertheless have a net magnetization of zero. The properties of the walls of such magnetic domains were studied in detail by Bloch, Landau, and Neel. Magnetic materials can be regarded now as being indispensable in modern technology.They are components of many electromechanical and electronic devices. For instance, an average home contains more than fifty of such devices of which ten are in a standard family car. Magnetic materials are also used as components in a wide range of industrial and medical equipment. Permanent magnet materials are essential in devices for storing energy in a static magnetic field. Major applications involve the conversion of mechanical to electrical energy and vice versa, orthe exerfon of a force on soft ferromagnetic objects. The applications of magnetic materials in information technology are continuously growing. In this treatment, a survey will be given of the most common modern magnetic mate-rials and their applications. The latter comprise not only permanent magnets and invar alloys but also include vertical and longitudinal magnetic recording media, magneto-optical recording media, and head materials. Many of the potential readers of this treatise may have developed considerable skill in handling the often-complex equipment of modem information technology without having any knowledge of the materials used for data stor-age in these systems and the physical principles behind the writing and the reading of the data. Special attention is therefore devoted to these subjects. Although the topic Magnetic Materials is of a highly interdisciplinary nature and com-bines features of crystal chemistry, metallurgy , and solid state physics, the main emphasis will be placed here on those fundamental aspects of magnetism of the solid state that form the basis for the various applications mentioned and from which the most salient of their properties can be understood. It will be clear that all these matters cannot be properly treated without a discussion of some basic features of magnetism. In the first part a brief survey will therefore be given of the origin of magnetic moments, the most common types of magnetic ordering, and molecular field theory. Attention will also be paid to crystal field theory since it is a prereq- uisite for a good understanding of the origin of magnetocrystalline anisotropy in modem permanent magnet materials. The various magnetic materials, their special properties, and the concomitant applications will then be treated in the second part.

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内容概要

《磁性物理学和磁性材料》是一部讲述磁性基础理论的教程。
书中讲述了磁矩起源，应用磁性场的响应，不同的相互作用产生了固体中磁序的不同形式，及其许多例子。
书中以能够让读者充分理解材料性质的深度讲述了晶场模拟效应，晶场模拟效应在材料性质的扮演着重要角色，并以同样深度讲述了巡回电子磁性。
书中还特别讲述了磁晶磁性各向异性和磁热效应，一般磁性计算知识也得以呈现。
书中有一半的内容用于讲述磁性材料和性质，这使得其应用广泛。
另外，本书很有技巧地讲述了永磁体、高密度记录材料、软磁性材料、invar合金和磁控材料。

目次：引入；原子矩的起源；自由离子的顺磁性；磁性有序状态；晶体场；逆磁性；巡回电子磁性；基本概念和单位；测量技巧；磁性材料中的热效应；磁性的各向异性；永磁体；高密度记录材料；软磁性材料；invar合金；磁控材料。

读者对象：物理专业、材料科学和工程以及电子工程材料的高年级本科生和研究生，以及相关专业的科研人员。

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《磁性物理学和磁性材料(英文)》读者对象物理专业、材料科学和工程以及电子工程材料的高年级本科生和研究生，以及相关专业的科研人员。

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