普通高等教育“十二五”规划教材

PUTONG GAODENG JIAOYU "12·5" GUIHUA JIAOCAI

Mining of Non-ferrous Metal Deposits

有色金属矿床开采

主　编　占丰林　叶　萍
副主编　凌征华　俞　惠

冶　金　工　业　出　版　社
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内 容 提 要

本书为冶金类院校英语专业和采矿工程专业开设的有色金属方面特色课程所用的教材之一。全书共分6章，主要内容包括：采矿和有色金属矿床简介、炸药与爆破、有色金属矿山运输、有色金属矿山通风、岩石力学以及有色金属矿床采矿方法等。为便于教学，每章前附有本章的中文内容摘要，每章后附有本章的专业术语词汇表及复习思考题。

本书可作为冶金类院校英语专业本科生的泛读教材、采矿工程专业本科生的专业英语教材和采矿概论双语课程的教材，也可作为采矿工程专业人员出国考察访问、进修或攻读学位前的培训或自学教材，还可供广大采矿工程师及采矿工程技术人员学习参考。

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前　言

随着我国市场经济的发展壮大，行业分工越来越细、越来越综合，对专门人才、特色人才和复合应用型人才的需求日益旺盛，这对我国高等教育的人才培养也产生了巨大的影响。2007 年，教育部高等学校外语专业教学指导委员会评估组专家对一些大学的英语专业本科教学工作提出了“走特色办学之路”的建议。因此，高校专业特色化是当前人才培养的方向。

有色金属采矿、选矿和冶金是冶金类院校的强势特色专业。因此，此类高校的英语专业应具有有色冶金特色。特色专业需要特色系列教材，目前市场上正式出版的有色金属采矿、有色金属选矿和有色金属冶金方面的英文教材比较少。同时冶金类院校采矿工程专业使用的专业英语教材的专业知识不够深入系统。本书是冶金类院校英语专业和采矿工程专业开设的有色金属方面特色课程所用的教材之一，旨在使这些院校英语专业和采矿工程专业的学生通过专业英语的学习掌握采矿工程专业知识，使英语专业和采矿工程专业的学生不仅能够用英语进行日常会话、翻译，还可以熟练地使用英语进行采矿工程专业方面的听、说、读、写、译，这也是当今冶金采矿行业最稀缺的复合应用型人才之一。

本书可作为冶金类院校英语专业本科生的泛读教材、采矿工程专业本科生的专业英语教材和采矿概论双语课程的教材，也可作为采矿工程专业人员出国考察访问、进修或攻读学位前的培训或自学教材，还可供广大采矿工程师及采矿工程技术人员学习参考。在本书实际使用过程中，使用者可根据使用目的的不同和学时的多少进行选择性的讲解、学习或阅读。

全书共分 6 章，主要内容包括：采矿和有色金属矿床简介、炸药和爆破、有色金属矿山运输、有色金属矿山通风、岩石力学以及有色金属矿床采矿方法等。本书由占丰林教授、叶萍副教授担任主编，凌征华教授、俞惠副教授担任副主编。其中第 1、3、5、6 章由占丰林编写，第 2 章由叶萍编写，4.3～4.6 节

由凌征华编写，4.1～4.2节由俞惠编写，全书由占丰林统稿。

本书在编写过程中参考了国内外相关书籍、论文或网页，在此对这些参考资料的作者表示诚挚的感谢。由于编者水平有限，书中难免有疏漏之处，敬请广大读者批评指正。

编 者

2011年元月

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Introduction to Mining and Non-ferrous Metal Deposits

本章介绍一些采矿专业术语、有色金属矿床概念、采矿与人类文明、采矿对环境的影响、矿床评价与资源保护以及有用矿物回收方法，最后阐述中国有色金属工业的现状与未来。

1.1 Mining's Role

1.1.1 Minerals, Rocks and Ore

In the year 1971, the number of known elements amounted to 104. Fifteen of these have been made only in the laboratory, others may have persisted from the primitive atmosphere, but, by and large, elements originated from magmas or igneous rocks of the outer rocky shell of the earth. Only eight elements constitute 98% by weight of the earth's crust. These are oxygen, 47%; silicon, 28%; aluminum, 8%; iron, 5%; and sodium, magnesium, potassium and calcium, less than 4% each. These common elements and the other less common ones are the building blocks of minerals, of which there are over 2000 varieties.

According to Webster: "A mineral is an inorganic substance occurring naturally in the earth and having a consistent and distinctive set of physical properties and a composition that can be expressed by a chemical formula. The term is sometimes applied to organic substances, such as coal." Thus, minerals are precise combinations of elements. Rocks, as distinct from minerals, are composed of assemblages of minerals.

When minerals are found in sufficient concentration to warrant extraction by mining, the mineralized area is considered an ore deposit. The definition of ore is mineral that can be extracted from the ground at a profit. The economic connotation is implicit in the word ore.

Since most of the useful elements compose such a small percentage of the earth's crust, the occurrence of ore deposits as we know them would not have transpired had not geologic processes concentrated the elements.

1.1.2 Professional Terms of Mining

Extensive coverage of the many descriptive terms used in mining may be found in a good mining glossary, such as is available from the Superintendent of Documents, but for convenience a number of the more common definitions are given here.

Mining may be defined, as by A. B. Cummins, as the act, process or work of extracting minerals or coal from their natural environment and transporting them to the point of processing or use. Mining techniques are applied to extracting metallic minerals, such as ores of gold, copper, lead or zinc; to fuels, such as coal, anthracite, lignite and tar sands; and to nonmetallic minerals, such as limestone, sand and gravel, clay and stone, sulfur and salt. These are just a few of the many minerals extracted by mining processes.

A mine, therefore, is an excavation made in the earth for the purpose of extracting minerals. Such excavations may be at the surface or underground, or both surface and underground methods may be employed.

The selection of mining methods is made to effect the most economic recovery of the minerals (see Section 6.1). Formerly, the type of deposit and the physical characteristics of the deposit and the enclosing rocks were the dominant factors in selecting the mining method. Today, preservation of the environment can be equally important in determining the method.

Most base metal deposits are composed of several valuable minerals mixed with waste minerals called gangue. In mining, the objective is to extract as much of the valuable mineral as possible and leave behind the waste. The material coming from the mine, called ore, is naturally a combination of valuable minerals and gangue.

The ore, in the case of metallic deposits, usually is processed at the mine to concentrate the valuable mineral for shipment to the smelter or other refining facility. The gangue is discarded.

Nonmetallic deposits and fuels, unlike metalliferous deposits, contain more of the valuable mineral or element than of waste. Nonmetallic minerals, also called industrial minerals, are prepared at the mine into a finished product, or the prepared mineral may be shipped elsewhere for additional treatment before being marketed.

Coal usually is washed at the mine to remove to the maximum extent possible slate and other impurities, and then shipped to the power plant, coke ovens or other consumer. A modern development is the construction of power plants at the mine, which have become known as "mine mouth power plants."

There are several types of surface mines. In an open-pit mine, an excavation open to the surface is dug to extract metallic ores (see Section 6.3). In the typical open pit, digging progresses in terraces. In a strip mine, the overlying surface material (called spoil, overburden or waste) is removed to expose a coal bed for digging. A quarry is an excavation for extracting stone, sand or gravel. In a placer mine, the valuable material is found on the bedrock beneath gravel in stream beds, fossil stream beds or flood plains and is recovered by panning, hydraulicking or dredging. Seawater processing, wherein salt or magnesium is extracted by evaporation or chemical processing, although