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ISBN 978-7-5020-4425-1



9 787502 104425 >

定价：30.00元

**English for Coal Mining Engineering**

**采 矿 工 程 英 语**

潘卫东 编著

煤 炭 工 业 出 版 社

· 北 京 ·

**图书在版编目 (CIP) 数据**

采矿工程英语 / 潘卫东编著. -- 北京: 煤炭工业出版社,  
2014

ISBN 978-7-5020-4425-1

I. ①采… II. ①潘… III. ①矿山开采—英语 IV. ①H31

中国版本图书馆 CIP 数据核字 (2014) 第 016475 号

煤炭工业出版社 出版  
(北京市朝阳区芍药居 35 号 100029)  
网址: [www.cciph.com.cn](http://www.cciph.com.cn)  
北京玥实印刷有限公司 印刷  
新华书店北京发行所 发行

\*

开本 787mm × 1092mm<sup>1</sup>/<sub>16</sub> 印张 14<sup>3</sup>/<sub>4</sub>  
字数 344 千字 印数 1—1 000  
2014 年 3 月第 1 版 2014 年 3 月第 1 次印刷  
社内编号 7257 定价 30.00 元

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## 内 容 提 要

本书内容包含煤炭资源介绍、矿山地质与测量、采矿方法及装备、矿物加工、矿业开发与环境保护、矿山安全与管理、未来采矿技术等采矿工程专业知识，反映了当前煤炭工业的新技术和新发展。英文章节篇幅适中，每篇文章后面列出了生词和注释，通俗易懂，方便读者快速学习和阅读。本书还介绍了应用文的写作知识，提供了英语泛读文章和常用的矿业工程专业技术词汇，便于读者学习、赏析和查阅。

本书既可作为高等院校采矿工程专业本科生的英语教材，也可供采矿工程专业研究生和从事采矿工程专业的技术和管理人员学习参考。

# 前 言

随着中国经济的快速发展,中国的矿业也正逐步向国际化、全球化方向发展。中国的矿业企业在不断走向国际化的过程中,伴随着新的机遇和挑战。同时,在经济国际化、全球化的大背景下,社会对国际化矿业人才的需求也越来越迫切。对于培养矿业人才的高等院校来说,必须牢牢把握时代脉搏,培养出适应社会发展的国际化人才。在多次对外交流过程中,我深深体会到,采矿、安全等矿业专业大学生,在具备了专业知识的同时,掌握好专业外语就意味着有更多的深造和就业机会,以及更加广阔的发展空间。因此,在开设采矿工程专业英语课程的同时,我根据自己对矿业英语的理解编撰了这本教材。

该书的内容以煤炭开采为基础,但并不局限于煤炭开采。为了拓宽学生的知识面,本教材的内容包括矿山地质与测量、采矿方法及装备、矿物加工、矿业开发与环境保护、矿山安全与管理、未来采矿技术等采矿工程专业知识,以及应用文写作方法、英文赏析和矿业工程技术词汇等内容。

本书共包括6个单元、30篇文章和4个附录,均由作者从国内外权威专业书刊和网站仔细挑选并精心编撰而成。每篇文章长度适中,语法标准,通俗易懂。同时,也希望本教材能够抛砖引玉,让读者结合自己的实际情况,去查阅和掌握更多的矿业知识和英语表达方法,真正做到学以致用。

本书既可作为高等院校采矿工程专业本科生的英语教材,也可供采矿工程专业研究生和从事采矿工程专业的技术和管理人员学习参考。

由于编者的水平有限,错漏、不足之处在所难免,恳请读者批评指正!本书在编写过程中参阅了大量的国内外资料,在此谨向有关文献的作者表示衷心的感谢。

作 者

2013年11月

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## **Unit 1 Introduction to Coal**

# **煤 的 概 述**



## Text 1 Coal 煤

Coal (from the Old English term *col*, which has meant “mineral of fossilized carbon” since the 13th century) is a combustible black or brownish-black sedimentary rock usually occurring in rock strata in layers or veins called coal beds or coal seams. The harder forms, such as anthracite coal, can be regarded as metamorphic rock because of later exposure to elevated temperature and pressure. Coal is composed primarily of carbon along with variable quantities of other elements, chiefly hydrogen, sulfur, oxygen and nitrogen (Figure 1-1 & Table 1-1).



Figure 1-1 Coal

Table 1-1 Composition of coal

Grade	Element
Primary	Carbon
Secondary	Hydrogen
	Sulfur
	Oxygen
	Nitrogen

Throughout history, coal has been a useful resource. It is primarily burned for the production of electricity and/or heat, and is also used for industrial purposes, such as refining metals. As a fossil fuel, coal forms when dead plant matter is converted into peat, which in turn is converted into lignite, then sub-bituminous coal, after that bituminous coal, and lastly anthracite. This involves biological and geological processes that take place over a long period.

Coal is the largest source of energy for the generation of electricity worldwide, as well as one of the largest worldwide anthropogenic sources of carbon dioxide releases. In 1999, world gross carbon dioxide emissions from coal usage were 8666 million tonnes of carbon dioxide. Coal-fired electric power generation emits around 2000 pounds of carbon dioxide for every megawatt-hour generated, which is almost double the approximately 1100 pounds of carbon dioxide released by a natural gas-fired electric plant per megawatt-hour generated. Because of this higher carbon efficiency of natural gas generation, as the fuel mix in the United States has changed to reduce coal and increase natural gas generation, carbon dioxide emissions have fallen. The emissions records measured in the first quarter of 2012 were the lowest for the first quarter of any year since 1992.

Coal is extracted from the ground by coal mining, either underground by shaft mining, or at

ground level by open pit mining extraction. Since 1983, China has been the world's top coal producer. In 2012 China produced 3650 millions tonnes of coal—47.5% of world coal production.

### New Words and Expressions

fossilized[ 'fɒsilaɪzd ]

*adj.* 石化的;僵化的;老化的

*v.* 石化(fossilize 的过去式和过去分词)

combustible[ kəm'bstɪb(ə)l ]

*n.* 可燃物;易燃物

*adj.* 易燃的;易激动的;燃烧性的

sedimentary[ sedi'mentri ]

*adj.* 沉淀的

metamorphic rock

[岩]变质岩

bituminous[ bi'tjuːmɪnəs ]

*adj.* 沥青的,含沥青的

anthropogenic[ ,ænrəpə'dʒenɪk ]

*adj.* 人为的;[人类]人类起源的

dioxide[ dai'ɒksaɪd ]

*n.* 氧化物

## Text 2 Types of Coal 煤的种类

As geological processes apply pressure to dead biotic material over time, under suitable conditions it is transformed successively into 7 types of coal as follows.

a. Peat, considered to be a precursor of coal, has industrial importance as a fuel in some regions, for example, Ireland and Finland. In its dehydrated form, peat is a highly effective absorbent for fuel and oil spills on land and water. It is also used as a conditioner for soil to make it more able to retain and slowly release water.

b. Lignite, or brown coal, is the lowest rank of coal and used almost exclusively as fuel for electric power generation. Jet, a compact form of lignite, is sometimes polished and has been used as an ornamental stone since the Upper Palaeolithic.

c. Sub-bituminous coal, whose properties range from those of lignite to those of bituminous coal, is used primarily as fuel for steam-electric power generation and is an important source of light aromatic hydrocarbons for the chemical synthesis industry.

d. Bituminous coal is a dense sedimentary rock, usually black, but sometimes dark brown, often with well-defined bands of bright and dull material. It is used primarily as fuel in steam-electric power generation, with substantial quantities used for heat and power applications in manufacturing and to make coke.

e. "Steam coal" is a grade between bituminous coal and anthracite, once widely used as a fuel for steam locomotives. In this specialized use, it is sometimes known as "sea-coal" in the US. Small steam coal (dry small steam nuts or DSSN) was used as a fuel for domestic water heating.

f. Anthracite, the highest rank of coal, is a harder, glossy black coal used primarily for residential and commercial space heating. It may be divided further into metamorphically altered bituminous coal and "petrified oil", as from the deposits in Pennsylvania.

g. Graphite, technically the highest rank, is difficult to ignite and is not commonly used as fuel—it is mostly used in pencils and, when powdered, as a lubricant.

The classification of coal is generally based on the content of volatiles. However, the exact classification varies between countries.

### New Words and Expressions

peat [pi:t]

n. 泥煤; 泥炭块; 泥炭色

lignite ['lignait]

n. [矿物] 褐煤

sub-bituminous coal

次烟煤

anthracite [ˈæŋθrəsait]

*n.* [矿物]无烟煤

bituminous coal

[矿物]烟煤; 沥青煤(等同于 soft coal)

graphite [ˈgræfait]

*n.* 石墨; 黑铅

steam coal

动力煤; [矿业]蒸汽煤; 短沼煤; 锅炉煤

## Text 3 Early Uses of Coal 煤的早期利用

Coal from the Fushun Mine in northeastern China was used to smelt copper as early as 1000 BCE (Figure 1-2). Marco Polo, the Italian who traveled to China in 13th century, described coal—which at that time was unknown to most Europeans as “black stones...which burn like logs”, and said coal was so plentiful, people could take three hot baths a week. In Europe, the earliest reference to the use of coal as fuel is from the geological treatise on stones by the Greek scientist Theophrastus (circa 371 – 287 BC):

*Among the materials that are dug because they are useful, those known as anthrakes [coals] are made of earth, and, once set on fire, they burn like charcoal. They are found in Liguria...and in Elis as one approach Olympia by the mountain road; and they are used by those who work in metals.*

—Theophrastus On Stones (English Translation)

Outcrop coal was used in Britain during the Bronze Age (3000 – 2000 BC), where it has been detected as forming part of the composition of funeral pyres. In Roman Britain, with the exception of two modern fields, “the Romans were exploiting coals in all the major coalfields in England and Wales by the end of the second century AD”. Evidence of trade in coal (dated to about AD 200) has been found at the Roman settlement at Heron bridge, near Chester, and in the Fenlands of East Anglia, where coal from the Midlands was transported via the Car Dyke for use in drying grain. Coal cinders have been found in the hearths of villas and Roman forts, particularly in Northumberland, dated to around AD 400. In the West of England, contemporary writers described the wonder of a permanent brazier of coal on the altar of Minerva at Aquae Sulis (modern day Bath), although in fact easily accessible surface coal from what became the Somerset coalfield was in common use in quite lowly dwellings locally. Evidence of coal’s use for iron – working in the city during the Roman period has been found. In Eschweiler, Rhineland, deposits of bituminous coal were used by the Romans for the smelting of iron ore.



Figure 1-2 Chinese coal miners in an illustration of the *Tiangong Kaiwu* encyclopedia, published in 1637

No evidence exists of the product being of great importance in Britain before the High Middle

Ages, after about AD 1000. Mineral coal came to be referred to as “seacoal” in the 13th century; the wharf where the material arrived in London was known as Sea coal Lane, so identified in a charter of King Henry III granted in 1253. Initially, the name was given because much coal was found on the shore, having fallen from the exposed coal seams on cliffs above or washed out of underwater coal outcrops, but by the time of Henry VIII, it was understood to derive from the way it was carried to London by sea. In 1257 – 1259, coal from Newcastle upon Tyne was shipped to London for the smiths and lime – burners building Westminster Abbey. Sea coal Lane and Newcastle Lane, where coal was unloaded at wharves along the River Fleet, are still in existence. (See Industrial processes below for modern uses of the term. )

These easily accessible sources had largely become exhausted (or could not meet the growing demand) by the 13th century, when underground extraction by shaft mining or adits was developed. The alternative name was “pitcoal”, because it came from mines. It was, however, the development of the Industrial Revolution that led to the large – scale use of coal, as the steam engine took over from the water wheel. In 1700, five – sixths of the world’s coal was mined in Britain. Britain would have run out of suitable sites for watermills by the 1830s if coal had not been available as a source of energy. In 1947, there were some 750000 miners, but by 2004, this had shrunk to some 5000 miners working in around 20 collieries.

### New Words and Expressions

outcrop [ˈaʊtkrɒp]

*n.* 露头; 露出地面的岩层

*vi.* 露出

contemporary [kənˈtemp(ə)r(ə)rɪ]

*n.* 同时代的人; 同时期的东西

*adj.* 当代的; 同时代的; 属于同一时期的

dwelling [ˈdwelɪŋ]

*n.* 住处; 寓所

*v.* 居住 (dwell 的现在分词)

exhausted [ɪgˈzɔːstɪd]

*adj.* 疲惫的; 耗尽的

*v.* 耗尽; 用尽; 使……精疲力尽 (exhaust 的过去式)

watermill [ˈwɒtəml]

*n.* 水磨, 水力磨粉机

shrink [ˈfrɪŋk]

*vi.* 收缩; 萎缩

*vt.* 使缩小, 使收缩

*n.* 收缩



## Text 4 Coal as Fuel 燃料煤

Coal is primarily used as a solid fuel to produce electricity and heat through combustion. World coal consumption was about 7.25 billion tonnes in 2010 (7.99 billion short tons) and is expected to increase 48% to 9.05 billion tonnes (9.98 billion short tons) by 2030. China produced 3.47 billion tonnes (3.83 billion short tons) in 2011. India produced about 578 million tonnes (637.1 million short tons) in 2011. 68.7% of China's electricity comes from coal. The USA consumed about 13% of the world total in 2010, i. e. 951 million tonnes (1.05 billion short tons), using 93% of it for generation of electricity. 46% of total power generated in the USA was done using coal (Figure 1-3 & Figure 1-4).

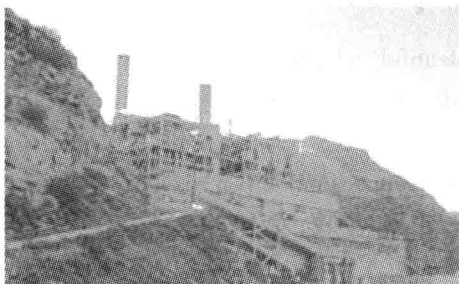


Figure 1-3 Castle Gate Power Plant  
near Helper, Utah, USA

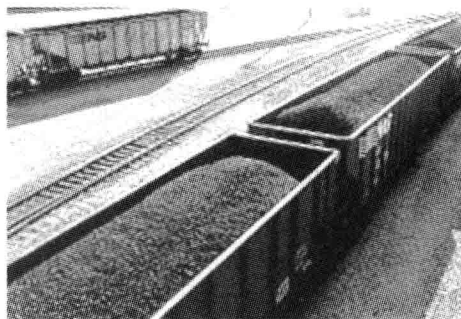


Figure 1-4 Coal rail cars

When coal is used for electricity generation, it is usually pulverized and then combusted (burned) in a furnace with a boiler. The furnace heat converts boiler water to steam, which is then used to spin turbines which turn generators and create electricity. The thermodynamic efficiency of this process has been improved over time. Simple cycle steam turbines have topped out with some of the most advanced reaching about 35% thermodynamic efficiency for the entire process. Increasing the combustion temperature can boost this efficiency even further. Old coal power plants, especially “grandfathered” plants, are significantly less efficient and produce higher levels of waste heat. At least 40% of the world's electricity comes from coal, and in 2012, about one third of the United States' electricity came from coal, down from approximately 49% in 2008. As of 2012 in the United States, use of coal to generate electricity was declining, as plentiful supplies of natural gas obtained by hydraulic fracturing of tight shale formations became available at low prices. The emergence of the supercritical turbine concept envisions running a boiler at extremely high temperatures and pressures with projected efficiencies of 46%, with further theorized increases in temperature and pressure perhaps resulting in even higher efficiencies.