

高职高专“十二五”规划教材

化工专业英语

(煤化工方向)

Specialized English
for Chemical Industry

— Specialized in Coal
Chemical Industry

乔琳 主编



化学工业出版社

高职高专“十二五”规划教材

化工专业英语

（煤化工方向）

**Specialized English
for Chemical Industry**

— **Specialized in Coal
Chemical Industry**

乔琳 主编



化学工业出版社

· 北京 ·

本书依据高职高专教学改革的实践编写而成。根据化工企业实际的生产流程,将化工原料的选取、化工设备的选型、化工工艺路线的选择、化工产品的提纯、化工产品的分析和化工产品的介绍作为6个教学模块,6个模块下包含11个课内任务和6个相关的课外任务,每个任务中又包括传统教学部分和任务驱动教学部分。课内任务可满足高职高专提倡的“实用、够用”原则,课外任务可满足学生知识拓展的要求,教师可根据学习情况灵活选择教学内容。

本教材可作为高职高专煤化工、煤炭深加工与利用、应用化工生产技术、化工设备维修等专业学生教材。

图书在版编目(CIP)数据

化工专业英语(煤化工方向)/乔琳主编. —北京:化学工业出版社, 2014. 1
高职高专“十二五”规划教材
ISBN 978-7-122-19278-3

I. ①化… II. ①乔… III. ①煤化工-英语-高等职业教育-教材 IV. ①H31

中国版本图书馆CIP数据核字(2013)第299516号

责任编辑: 窦臻 张双进
责任校对: 蒋宇

文字编辑: 林媛
装帧设计: 张辉

出版发行: 化学工业出版社(北京市东城区青年湖南街13号 邮政编码100011)
印 装: 大厂聚鑫印刷有限责任公司
787mm×1092mm 1/16 印张7 字数120千字 2014年3月北京第1版第1次印刷

购书咨询: 010-64518888(传真: 010-64519686) 售后服务: 010-64518899
网 址: <http://www.cip.com.cn>
凡购买本书,如有缺损质量问题,本社销售中心负责调换。

定 价: 19.00 元

版权所有 违者必究

编写人员名单

主 编 乔 琳

副主编 薛 巍 任 娜

编 者 乔 琳 薛 巍 任 娜

赵莉娜 王智慧 杨小霞

张金贵 高玲玲

前 言

随着我国化学工业和高职高专教学改革的发展，社会对化工人才的素质、高职高专院校的教学都提出了新的要求。为了适应这一要求，编者在多年化工专业英语教学实践的基础上编写了本书。

本教材特点如下。

1. 基于岗位调研，更实用。编者通过对神华集团多家大型化工企业一线生产技术人员、翻译人员和管理人员进行采访并下发问卷，了解化工行业发展现状与趋势、人才需求、岗位设置等方面情况形成了岗位调研报告，确立了本课程的职业能力目标。编者结合高职高专学生的学情，遵守“实用、够用”原则，将教学内容分为6个模块：化工原料的选取、化工设备的选型、化工工艺路线的选择、化工产品的提纯、化工产品的分析和化工产品的介绍。6个模块包括11个具体的任务，与实际的工作相结合。6个模块就是完整的化工企业生产的过程。6个教学模块与学生日后的实际工作联系紧密，实用性很强，最终达到学生职业能力的培养目标，从而使学生的职业核心能力得到提升。

2. 传统教学内容与任务驱动教学内容相结合。为了适应不同的教学需求，本教材将教学内容分为传统教学和任务驱动教学。在实际教学中采用任务驱动教学法，将具体的任务下发给学生，激发学生学习化工专业英语的兴趣，充分调动了学生的学习积极性，提高学生的学习效果，做到了“教—学—做”一体，为学生毕业后走上化工操作岗位打好坚实基础。

3. 课内任务和课外任务相结合。本教材在编写时加入了与课内任务相关的6个课外任务，满足了学生不同的学习需求，教师可根据实际情况灵活选择。

为了便于教学，本书配有课程标准，课程整体设计方案和单元设计方案，使用本教材的学校可以发邮件至 cipedu@163.com，免费索取。

编者对本书编写过程中给予帮助和支持的刘春颖和王春表示衷心感谢。

由于编者水平有限，疏漏和不妥之处在所难免，恳请专家和读者不吝指正，以便完善。

编者

2013年10月

Contents

Module 1	Selection of Chemical Raw Material	1
Task One	Coal	1
Part I	Traditional Teaching Material; Coal	1
Part II	Task-based Teaching Material	2
Task Two	Processing and Utilization of Coal	6
Part I	Traditional Teaching Material; Processing and Utilization of Coal	6
Part II	Task-based Teaching Material	8
Module 2	Selection of Chemical Equipments	11
Task One	Chemical Containers and Heat Exchangers	11
Part I	Traditional Teaching Material; Chemical Container and Heat Exchanger	11
Part II	Task-based Teaching Material	13
Task Two	Towers and Stirrers	16
Part I	Traditional Teaching Material; Towers and Stirrers	16
Part II	Task-based Teaching Material	18
Module 3	Selection of Chemical Process	21
Task One	Summary of Coal Chemical Technology	21
Part I	Traditional Teaching Material; Summary of Coal Chemical Technology	21
Part II	Task-based Teaching Material	23
Task Two	Coal Gasification Process	26
Part I	Traditional Teaching Material; Coal Gasification Process	26
Part II	Task-based Teaching Material	27
Module 4	Chemical Product Purification	31
Task One	The Separation and Use of Coke-oven Gas	31
Part I	Traditional Teaching Material; The Separation and Use of Coke-oven Gas	31
Part II	Task-based Teaching Material	34
Module 5	Chemical Products' Analysis	38
Task One	The Importance of Chemical Test	38
Part I	Traditional Teaching Material; The Importance of Chemical Test	38

Part II	Task-based Teaching Material	40
Task Two	Analysis of Chemical Products	44
Part I	Traditional Teaching Material; Analysis of Chemical Products	44
Part II	Task-based Teaching Material	47
Module 6	Chemical Products Introduction	51
Task One	Introduction of Traditional Coal Chemical Products	51
Part I	Traditional Teaching Material; Introduction of Traditional Coal Chemical Products	51
Part II	Task-based Teaching Material	52
Task Two	Introduction of Modern Coal Chemical products	56
Part I	Traditional Teaching Material; Introduction of Modern Coal Chemical products	56
Part II	Task-based Teaching Material	57
B-line Task	61
Appendix I	Chinese Translation of Text	79
Appendix II	Glossary	89
Appendix III	Instructions of Teaching Material	101
Reference	104

目 录

模块一 化工原料的选取	1
任务一 煤	1
第一部分 传统教学材料：煤	1
第二部分 任务驱动教学材料	2
任务二 煤的加工利用	6
第一部分 传统教学材料：煤的加工利用	6
第二部分 任务驱动教学材料	8
模块二 化工设备的选型	11
任务一 化工容器和换热器	11
第一部分 传统教学材料：化工容器和换热器	11
第二部分 任务驱动教学材料	13
任务二 塔和搅拌器	16
第一部分 传统教学材料：塔和搅拌器	16
第二部分 任务驱动教学材料	18
模块三 化工工艺路线的选择	21
任务一 煤化工技术概述	21
第一部分 传统教学材料：煤化工技术概述	21
第二部分 任务驱动教学材料	23
任务二 煤气化工艺	26
第一部分 传统教学材料：煤气化工艺	26
第二部分 任务驱动教学材料	27
模块四 化工产品的提纯	31
任务一 炼焦煤气的分离和利用	31
第一部分 传统教学材料：炼焦煤气的分离和利用	31
第二部分 任务驱动教学材料	34
模块五 化工产品的分析	38
任务一 化工检验重要性	38
第一部分 传统教学材料：化工检验重要性	38
第二部分 任务驱动教学材料	40
任务二 化工产品的分析	44
第一部分 传统教学材料：化工产品的分析	44

第二部分 任务驱动教学材料	47
模块六 化工产品的介绍	51
任务一 传统煤化工产品介绍	51
第一部分 传统教学材料：煤	51
第二部分 任务驱动教学材料	52
任务二 现代煤化工产品介绍	56
第一部分 传统教学材料：煤	56
第二部分 任务驱动教学材料	57
课外任务	61
附录一 课文中文翻译	79
附录二 化工专业英语词汇	89
附录三 教材使用说明	101
参考文献	104

Module 1 Selection of Chemical Raw Material

Task One Coal

Part I Traditional Teaching Material: Coal

China is the earliest country who begins to develop and use coal. It contains abundant coal resource, whose total amount ranks the third place among the world. Nowadays, coal resource has become the basic power source and important chemical raw material of our country.

Coal is the organic mineral precipitate transformed from the chemical and physical reactions of the plant remains, which is the complex mixture of organic and inorganic substances. The main component of coal is organic substance, that's why the coal molecule structure contains the special structure of organic substance. There are great differences among different kinds of coal, different parts of the same kind of coal, different coal seams of the same region. The reasons for the various differences are closely related to the substances, environment and reactions of the materials that form the coal.

Plants are mainly composed of organic substances, but also contain a certain amount of inorganic substances. From the chemical point of view, the organic substances can be divided into four groups: sugar and its derivatives, lignin, proteins and lipids, but not all the plants can be transformed into coal, the formation of the coal has four conditions, namely: the ancient plant species; climatic conditions; natural and geographical conditions and the conditions of crystals movement and only with these four conditions at the same time, large reserves of the major coalfields can be transformed after their long and harmonious reactions. The formation of coal is a complex and lengthy process; it normally takes millions of years to hundreds of millions of years. Plants are gradu-

ally transformed into coal, from junior stage to senior stage, which are: plants, peat, lignite, bituminous coal, anthracite.

Coal, oil, and natural gas are the primary fossil energy. According to the forecasts of China National Petroleum Corporation., from 2010 to 2020, fossil energy will remain the dominant position in the global primary energy consumption. Based on the characteristics of coal resource, it is obvious that coal resource will remain China's major energy consumption in the decades.

New words

harmonious [hɑ:'məʊniəs] *adj.* 和谐的, 和睦的

anthracite ['ænθrəsait] *n.* 无烟煤

abundant [ə'bʌndənt] *adj.* 丰富的, 充裕的

rank [ræŋk] *vi.* 居某地位

organic [ɔ:'gænik] *adj.* 有机的

mineral ['minərəl] *n.* 矿物

precipitate [pri'sipiteit] *n.* 沉淀物

transform [træns'fɔ:m] *vt.* 改变

physical ['fɪzɪkl] *adj.* 物质的

reaction [ri'ækʃn] *n.* 反应

complex ['kɒmpleks] *adj.* 复杂的

mixture ['mɪkstʃə(r)] *n.* 混合物

inorganic [ɪnɔ:'gænik] *adj.* 无机的

substance ['sʌbstəns] *n.* 物质

component [kəm'pəʊnənt] *n.* 成分

molecule ['mɒlɪkjʊ:l] *n.* 分子

derivative [dɪ'rɪvətɪv] *n.* 衍生物

lignin ['lɪgnɪn] *n.* 木质素

protein ['prəʊti:n] *n.* 蛋白质

lipid ['lɪpɪd] *n.* 脂质

Part II Task-based Teaching Material

In this section, firstly, the teacher divides the whole class into several groups and appoints a group leader. Secondly, the teacher gives the following material to the students, then ask them to consult dictionary and other tools to

finish the translation task. In this way, they can improve their comprehensive English. At last, the students have to complete the task form.

Expanded Knowledge: Natural Gas

Natural gas is a mixture of multi-component gas. Its main component is hydrocarbons, among which methane is the predominant one in addition to small amounts of ethane, propane and butane. Moreover, there are also containing hydrogen sulfide, carbon dioxide, nitrogen and water vapor and traces of inert gas such as helium and argon. Under standard condition, methane to butane exist in the state of gas, above pentane are liquid. The matters which can affect the health of respiratory that natural gas produced in the process of combustion are quite rare. The amount of carbon dioxide natural gas produces is only about 40% of that coal produces, releasing very little sulfur dioxide. What's more, after combustion of natural gas, there are no residue and waste water produced. Compared with coal, oil and other energy resources, natural gas possesses the advantages of the use of safe, high heat value, cleanliness and other advantages.

续表

考核标准:1. 专业英语表述准确,忠实原文,语句通顺; 2. 团队合作良好,每位员工都能全力工作; 3. 在规定时间内完成任务,并能认真书写任务报告; 4. 小组汇报表现良好。						
考核 分值	教师评分 7 分		学生自评 0.5 分			学生互评 0.5 分
教师 评分						
学 生 自 评	姓 名	自评分数				
	1					
	2					
	3					
	4					
	5					
学 生 互 评	姓 名	互评得分 1	互评得分 2	互评得分 3	互评得分 4	互评平均分
	1					
	2					
	3					
	4					
	5					
学 生 分 数 合 计	姓 名	教师评分	自评分数	互评分数	总计	
	1					
	2					
	3					
	4					
	5					

Task Two Processing and Utilization of Coal

Part I Traditional Teaching Material: Processing and Utilization of Coal

Coal is an important energy source, also an important raw material in metallurgy and chemical industry, which is mainly used in combustion, carbonization, gasification, liquefaction and so on.

1. Combustion

The purpose of burning coal should be to release their energy maximumly and quickly. In the combustion process of coal, it generates gas compound and the residues of solid carbon. The simplest gas compounds are methane and acetylene, and water gas can also be produced at high temperature. Burning solid carbon residues in the air will eventually be turned into water gas. The coal combustion process is chemical reaction that happens on the surface of coal. The reaction speed is decided by the size of the coal surface and the quantity of the supplied air. In the reaction, the larger the surface area of coal is, the more the amount of supplied air, then the faster the speed will response.

2. Coal Carbonization

It refers to the process in which coal is heated and decomposed in the absence of air, then generates coke (or semi-coke), coal tar, crude benzene, gas and other products. According to different final temperature at different heating condition, coal carbonization can be divided into three types: 900~1100 °C high temperature carbonization, also namely the coking; 700~900 °C medium temperature carbonization; 500~600 °C low temperature carbonization. High temperature carbonization (coking) is widely used. Its product, coke, are mainly used for blast furnace ironmaking and foundry, and also can be used to produce nitrogen fertilizer and calcium carbide; coke oven gas is a kind of fuels, also an important chemical raw material. Coal tar can be used to produce fertilizer, pesticides, synthetic fiber, synthetic rubber, paints, dyes, pharmaceuticals, explosives and so on.

3. Coal Gasification

It is a thermo-chemical process in which coal or coal coke as raw material,

oxygen (air, enrichment of oxygen or pure oxygen), steam or hydrogen as gasification agent, the combustible part of coal or coal coke is transformed into the fuel gas at high temperature by chemical reaction. The coal gasification process can be divided into five basic types: self-heated steam gasification, outside heated steam gasification, hydrogenation of coal gasification, the substitute of natural gas by manufacturing the combination of coal steam gasification and hydrogen gasification, the substitute of natural gas by manufacturing the combination of steam gasification of coal and machination.

4. Coal Liquefaction

It is an advanced clean coal technology by which the solid coal is turned into liquid fuels, chemical raw materials and products by chemical process. Coal liquefaction can be divided into direct liquefaction and indirect liquefaction. Direct liquefaction is to paralyze and hydrogenate coal molecules in the role of catalyst and solvent at high temperature (400 °C above) and high pressure (10MPa or above), directly converting into liquid fuel, and then further processed and refined into gasoline, diesel and other fuel oil. Coal liquefaction is also known as hydroliquefaction. Indirect liquefaction of coal is a process in which all the coal is firstly gasified into synthetic gas, and then takes the coal-based synthesis gas (carbon monoxide and hydrogen) as raw materials which are catalyzed and synthesized into hydrocarbon fuel, chemical raw materials and products.

New words

metallurgy [mi'tælədʒi] *n.* 冶金

combustion [kəm'bastʃən] *n.* 燃烧

carbonization [kɑ:bənaɪ'zeɪʃn] *n.* 碳化, 干馏

gasification [gæsɪfɪ'keɪʃən] *n.* 气化

liquefaction [lɪkwɪ'fækʃən] *n.* 液化

maximize ['mæksɪmaɪz] *vi.* 达到最大值

generate ['dʒenəreɪt] *vt.* 产生

compound ['kɒmpaʊnd] *n.* 复合物

residue ['rezɪdʒu:] *n.* 残余, 残渣

solid ['sɒlɪd] *adj.* 固体的; *n.* 固体

methane ['mi:θeɪn] *n.* 甲烷, 沼气

- acetylene [ə'setəli:n] *n.* 乙炔, 电石气
 eventually [ɪ'ventʃuəli] *adv.* 终于, 最后
 surface ['sɜ:fɪs] *n.* 表面
 response [ri'spɒns] *n.* 反应
 decompose [ˌdi:kəm'pəʊz] *vt. & vi.* 分解
 coke [kəʊk] *n.* 焦炭, 焦煤
 benzene ['benzi:n] *n.* 苯
 nitrogen ['naɪtrədʒən] *n.* 氮, 氮气
 fertilizer ['fɜ:təlaɪzə (r)] *n.* 肥料, 化肥
 calcium ['kælsiəm] *n.* 钙
 carbide ['kɑ:baid] *n.* 碳化物
 pesticide ['pestɪsaɪd] *n.* 杀虫剂, 农药
 synthetic [sɪn'θetɪk] *adj.* 合成的
 fiber ['faɪbə] *n.* 光纤, (织物的) 质地, 纤维
 dye [daɪ] *n.* 染料, 染色
 pharmaceutical [ˌfɑ:mə'su:tɪkl] *adj.* 制药的, 配药的; *n.* 药物
 explosive [ɪk'spləʊsɪv] *n.* 爆炸物
 catalyst ['kætəlist] *n.* 触媒, 催化剂
 diesel ['di:zl] *n.* 柴油机

Part II Task-based Teaching Material

In this section, firstly, the teacher divides the whole class into several groups and appoints a group leader. Secondly, the teacher gives the following material to the students, then ask them to consult dictionary and other tools to finish the translation task. In this way, they can improve their comprehensive English. At last, the students have to complete the task form.

Expanded Knowledge: Coal Chemical Industry

Coal chemical industry is a high pollution, highly safe requirements industry. It has long operating cycle and complex process. Each session will generate a variety of pollutants, although some of them can be recycled, but most of the parts that can not be recycled are toxic and harmful and may cause severe environmental safety accidents even by slightly carelessness.