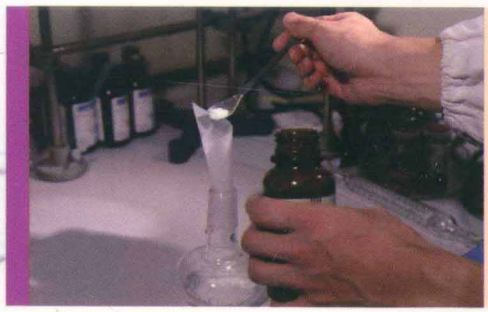
普通高等教育“十二五”规划教材

专业基础课教材系列



Practical English for Chemical Industry

化工实用英语

张　科◎主　编
李　应　罗冰雁　吴明珠◎副主编

科学出版社

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科学出版社

北京

内 容 简 介

本书从化工职场安全与健康、常用无机原料、常用有机原料、常用实验仪器、分析测试仪器、大型化工设备、化工文献溯源、销售及售后交流八个方面着手进行编写，涉及各个方面理论和实践的主要英语单词、句段，每个单元都包括了单元描述、职场对话、应用短文及词汇、练习及补充阅读等内容，从听、说、读、写、译方面全方位培养学生在化工职场进行英语交流的语言综合应用能力和特殊用途英语实践能力。

本书既适用于化工类相关专业，也适用于社会从业人员。

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前言

加入WTO后，我国的化工行业迎来了快速发展期，但想要拥有竞争优势，就必须了解并学习其他国家先进的化工专业技术。在此形势下，化工职场英语的学习就变得非常重要。鉴于市场上针对职业院校和应用技术院校学生化工专业英语的教材很少，且学科化倾向严重，教材难度偏大，本书的开发正好弥补了现有化工专业英语的不足，突出了职业英语的特色，进一步促进了特殊用途英语教学实践的改革和发展。

本书主要采用“以能力为本位，以学生为中心”的教材开发原则，结合“基于工作过程的学习”的教学理念，通过独特的教学板块，使学习者真正掌握化工行业需要的英语技能。

本书从需求出发，将教材开发原则和教学理念融入到编写之中。该书具有以下几个特点：

（1）着眼于提高学习者的职业技能和素质。本书根据职业院校学生的特点和语言学习能力，提供相关的实用练习，力求使学习者通过切合实际的学习过程打下一定的基础，在日后的工作中能更加熟练地掌握和使用化工职场英语进行学习和交流。

（2）实用性强。由于本书材料来源于真实职场，所以既适用于职业院校化工专业的学生，也适合作为化工行业培训教材。

（3）强调教学的整体性。每一单元都将听、说、读、写、译的基本英语技能融入于特定的化工职场工作任务，形成了一个有机整体，更利于学习者整体掌握学习内容，形成较强的英语语言综合应用能力和特殊用途英语实践能力。

（4）内容有弹性。每个单元除了有真实场景对话外，还提供了大量的相关术语、文章、实用练习，学习者可根据自己的需求和学习水平选择掌握的内容。

（5）图文并茂，生动直观。本书附有大量的图表，具有很强的直观性。

本书编写团队系长期从事特殊用途英语教学和化工专业教学的教师，具有丰富的教学经验和课程开发及设计经验，同时借鉴了澳大利亚、德国的职教英语开发理念和模式。

本书由重庆工业职业技术学院张科担任主编，重庆工业职业技术学院李应、重庆市工业学校罗冰雁、重庆工业职业技术学院吴明珠担任副主编，云南大学王家强教授和重庆工

业职业技术学院美籍教师 Megan Trott 担任主审。同时参与本书编写的人员还有重庆工业职业技术学院教师屈琦超、傅深娜、任进、刘磐。

本书的开发是在重庆工业职业技术学院院领导和系部领导的决策和支持下完成的，同时也得到诸多中外行业专家的指导和重庆化工职业学院、重庆市工业学校等院校的支持，在此表示衷心感谢！

由于水平有限，有不当之处请各位专家、同仁多提宝贵意见和建议，以便我们及时修改和完善。

目 录

Unit One

Health and Safety in Workshop

Unit Description

This unit identifies the health and safety equipment, emergency management knowledge, warning signs and safety posters in Chemistry workshops.

Dialogue

Thomas is a college student. He is visiting the German BASF Chemical Factory. Richard is a director of the factory. They are having a tour around the factory.

Richard : Thank you for coming today, Thomas. We can start any time.

Thomas : Hello, Richard. I'm all set.

Richard : You said yesterday that you wanted to see the workshop. The tour will last about an hour.

Thomas : No problem.

Richard : I'm sorry, but first you'll have to put on this helmet.

Thomas : OK. But this one seems a little small.

Richard : Please try this one instead.

Thomas : That's much better.

Richard : Great, we can start with the tour now.

Thomas : That's fine. I'll follow suit.

Safety and Health in Chemical Industry

The significance of Safety & Health in chemical industries has been a vital issue in achieving productivity and an edge in the competitive world. In a chemical factory, there are some chemical hazards which must be highly concerned.

1. Acids

Commonly, acids can be identified as tasting sour, reacting with metals such as calcium, and bases like sodium carbonate. Aqueous acids have a pH value of less than 7 and turn blue litmus paper red. Acids can be solutions, liquids, or solids. Gases can be acids as well.

2. Bases

Bases can be thought of as the chemical opposite of acids. A reaction between an acid and base is called neutralization.

3. Heavy metals

One of the largest problems associated with the persistence of heavy metals is the potential for bioaccumulation causing heavier exposure for some organisms than is present in the environment alone. For instance, lead is a poisonous substance to animals. It damages the nervous system and causes brain disorders. Excessive lead also causes blood disorders in mammals.

4. Solvent

A solvent is a liquid, solid, or gas that dissolves another solid, liquid, or gaseous solute, resulting in a solution that is soluble in a certain volume of solvent at a specified temperature. Petroleum can be used as a solvent as well.

5. Particulates

Particulates, also known as particulate matter (PM), fine particles and soot, are tiny subdivisions of solid matter suspended in a gas or liquid. Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer.

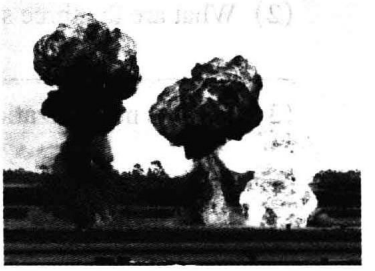
6. Fumes (noxious gases/vapors)

7. Highly-reactive chemicals

8. Fire, conflagration and explosion hazards

Conflagration is an uncontrolled burning that threatens human life, health, property or

ecology. A conflagration can be accidentally started, or intentionally created. Conflagrations can result in casualties, deaths or injuries, from smoke inhalation and/or burns.



An explosion is a rapid increase in volume and release of energy in an extreme manner, usually with the generation of high temperatures and the release of gases. An explosion creates a shock wave. If the shock wave is a supersonic detonation, then the source of the blast is called a "high explosive". Subsonic shock waves are created by low explosives through slower burning process known as deflagration.

Vocabulary

hazard *n.* 危害
calcium *n.* 钙
sodium *n.* 钠
Aqueous *adj.* 水的
pH *n.* 表示物质的酸碱度
bioaccumulation *n.* 有毒化学物质的生物体内积累
organism *n.* 有机物，有机体
solvent *n.* 溶剂
solute *n.* 溶解物，溶质
soot *n.* 烟灰
fume *n.* 烟雾，气味
conflagration *n.* 大火（灾）
ecology *n.* 生态
supersonic *adj.* 超音速的
detonation *n.* 爆炸

acid *n.* 酸
base *n.* 碱
carbonate *n.* 碳酸盐
litmus *n.* 石蕊
reaction *n.* 反应
neutralization *n.* 中和
mammal *n.* 哺乳动物
dissolve *v.* 使溶解
particulate *n.* 微粒，粒子
suspend *v.* 悬浮
noxious *adj.* 有毒的
explosion *n.* 爆炸
inhalation *n.* 吸入
subsonic *adj.* 次音速的
deflagration *n.* 爆燃过程

EXERCISES

1. Read the passage and answer the questions.

(1) How many chemical hazards are mentioned in the text? And what are they?

(2) What are the three states of acids?

(3) What is neutralization?

(4) What damages can excessive lead cause?

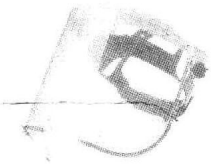
(5) What diseases can particulates result in?

(6) What is the difference between conflagration and exploration?

2. Group Discussion.

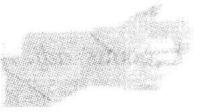
What are functions of the following personal protective equipment? Match the words with pictures.

a. ( )



b. ( )

c. ( )



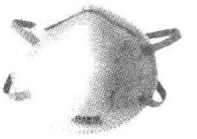
d. ( )

e. ( )

f. ( )

g. ( )

h. ( )



i. ( )

(1) respirator	(2) coverall	(3) safety gloves
(4) safety goggles	(5) face shield	(6) gas mask
(7) safety boots	(8) safety earmuff	(9) safety helmet

3. List six things you have in your workshop first-aid kit. Using these words make a dialogue with your partner.

Example:

PERSON A: Have you got a pair of tweezers in your workshop first-aid kit?

PERSON B: Yes, we do. / No, we don't.

PERSON B: Have you got a thermometer in your workshop first-aid kit?

PERSON A: Yes, we do. / No, we don't.

4. **What do you think these international signs mean? Discuss with your classmates.**

禁止入内
No entering

禁止靠近
No nearing

禁止带火种
No kinding

禁止穿化纤服装
No putting on
chemical fibre clothings

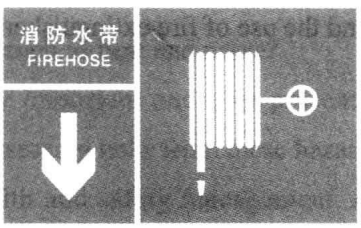
必须戴护耳器
Must wear ear protector

必须穿防护鞋
Must wear protective shoes

必须戴防护帽
Must wear protective cap

必须戴防护手套
Must wear protective gloves

必须戴防毒面具
Must wear gas defence mask



5. Design a bilingual safety rules poster for your workshop.

(The following sentences can be used as references.)

Safety Rules

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

7 .....

◆ Keep your work area clean and tidy.

◆ Store instruments and equipments safely.

◆ Pay attention to warning bells.

◆ Wear protective equipment where necessary.

◆ Report unsafe conditions to your supervisor.

◆ Learn the correct way to move things.

◆ Learn the location of the first aid kit.

◆ Learn the locations of emergency exits.

◆ Learn the proper use of chemical instruments and equipment.

◆ Learn the location and the use of fire extinguishers and fire alarms.

SUPPLEMENTARY READING

1. What kinds of chemicals are mentioned according to the passage?

_____

2. Can you list some non-chemical hazards in the passage?

_____

3. What issues and steps should we keep in mind for controlling and reducing risks?

_____

4. What parts of health and safety management should be focused on according to the passage?

_____

There are different categories of chemicals. It is impossible to address all the possible categories of course but some examples will be given:

● Organic solvents: these are used very extensively to extract and purify other chemicals from natural or manmade sources, as a vehicle within which to carry out reactions, as the reagents in themselves, and as a vehicle or active constituent of many final products. In high enough airborne concentrations most can cause nausea, headache, loss of consciousness and even death. Skin exposure can cause dermatitis through degreasing. Many of them are highly inflammable. Some of them have important neurotoxic, carcinogenic or other properties.

● Acids and alkalis: these are important reagents for many chemical reactions and purification processes. Most of them are highly corrosive by skin contact, especially by eye contact, but also by inhalation of aerosols. Hydrofluoric acid (used to etch glass),so to speek, are particularly notorious. Remember, besides their intrinsic hazard, they can and often do generate other hazardous substances in the course of reactions.

● Other agents: a categorization of these would be practically endless and it would be surprising to go to a chemical workplace which only had agents in the above mentioned categories.

What about non-chemical hazards such as heat and noise?

Do not forget these are also very important and ever-present risks of manual handling. Remember to address the methods of assessing risks from these hazards.

This is a very crucial part of health and safety management, into which your visit to the

workplace must investigate:

● Try and determine the attitudes of your host/manager/employee to the management of health and safety.

● Who are the key people responsible for conducting assessments of risk to health?

● What policies exist?

● How do they conduct risk assessments?

● What equipment and facilities do they have?

● How do they use them?

● Watch some of the assessments available, or at least a selection of the observations and the results from which the assessments are made.

● Consider the relative merit of some devices such as Drager tubes as compared to personal monitoring devices.

How about control of risks and risk reduction steps? We should think about the following questions:

● Remember the hierarchy of control of risks. Is this practiced in the workplace?

● What steps have been taken to eliminate or substitute hazardous substances?

● What steps have been taken to contain, or segregate exposure?

● What steps have been taken to use local exhaust ventilation where relevant? How effective is it? How well is it monitored?

● To what degree have workers been consulted, informed and trained in the relevant aspects of health and safety?

● What about personal protection? Is it overused in circumstances where more appropriate forms of control should have been applied? Is it under used? Is the correct protection being used for the task in hand and hence for relevant risks to health? How well is the personal protective equipment maintained?

Generally speaking, a visit to a chemical factory may be an exercise on its own or it may be a prelude to other forms of learning in the same workplace or elsewhere. In any case, leaving the factory gate is not the end of the information gathering and learning experience - merely the beginning.

Unit Two

Inorganic Compound

Unit Description

This unit identifies terms and expressions of the common inorganic ingredients used in chemical industry and workshops.

Dialogue

Linda is a freshman of Chemical Engineering Department of Qinghua University. One day, she has a class on inorganic compounds. Mr. Jefferson, her teacher, is talking about the elements he introduced before.

Jefferson: Alright, let's begin class! Who can tell me what we learned on the last class?

Linda: Mr. Jefferson, I would like to review what we learned before.

Jefferson: OK, go ahead.

Linda: You introduced a list of common inorganic and organometallic compounds of each element.

Jefferson: Very good. So what elements did I introduce last class?

Linda: Aluminium, Antimony, Barium, Bismuth, Boron, Calcium, Chlorine, Copper, Fluorine, Hydrogen, and Iron.

Jefferson: Well done. Can you give us some examples on inorganic compounds of Chlorine?

Linda: Sure. Common inorganic compounds of Chlorine can include Aluminium chloride, Ammonium chloride, Bismuth chloride, Carbon tetrachloride, and Hydrogen chloride.

Jefferson: Perfect. Can you write down molecular formulas of these compounds on the blackboard?

Linda: Yes, sir.

TEXT

A mineral acid (or inorganic acid) is an acid derived from one or more inorganic compounds. A mineral acid is not organic and all mineral acids release hydrogen ions when dissolved in water.

Commonly used mineral acids are sulfuric acid, hydrochloric acid and nitric acid (also known as bench acids). Mineral acids range from acids of great strength (example: sulfuric acid) to very weak boric acid. Mineral acids tend to be very soluble in water and insoluble in organic solvents. Mineral acids are used in many sectors of the chemical industry as feedstock for the synthesis of other chemicals, both organic and inorganic. Large quantities of these acids, especially sulfuric acid, nitric acid and hydrochloric acid are manufactured for commercial use in large plants. Mineral acids are also used directly for their corrosive properties. For example, a dilute solution of hydrochloric acid is used for removing the deposits from the inside of boilers, with precautions taken to prevent the corrosion of the boiler by the acid. This process is known as descaling.

Sample of hydrochloric acid in a bottle

There are some examples of mineral acids, such as hydrochloric acid, nitric acid, phosphoric acid, sulfuric acid, boric acid, hydrofluoric acid, perchloric acid and so on. We can take hydrochloric acid as an example.

Hydrochloric acid is a solution of hydrogen chloride (HCl) in water, which is a highly corrosive, strong mineral acid with many industrial uses. It is found naturally in gastric acid. Historically called muriatic acid, and spirits of salt, hydrochloric acid was produced from vitriol (sulfuric acid) and common salt. It first appeared during the Renaissance, and then it was used by chemists such as Glauber, Priestley and Davy in their scientific research. With major production starting in the Industrial Revolution, hydrochloric acid is used in the chemical industry as a chemical reagent in the large-scale production of vinyl chloride for PVC plastic, and MDI/TDI for polyurethane. It has numerous smaller-scale applications, including household cleaning, production

of gelatin and other food additives, descaling, and leather processing. About 20 million tones of hydrochloric acid are produced annually. Here is a table on physical properties of hydrochloric acid.

Concentration			Density	Molarity	pH	Viscosity	Specific heat	Vapour pressure	Boiling point	Melting point
kg HCl/kg	kg HCl/m^3	Baumé	kg/L	mol/dm^3	—	mPa · s	kJ/(kg · K)	kPa	℃	℃
10%	104.80	6.6	1.048	2.87	0.5	1.16	3.47	1.95	103	−18
20%	219.60	13	1.098	6.02	0.8	1.37	2.99	1.40	108	−59
30%	344.70	19	1.149	9.45	1.0	1.70	2.60	2.13	90	−52
32%	370.88	20	1.159	10.17	1.0	1.80	2.55	3.73	84	−43
34%	397.46	21	1.169	10.90	1.0	1.90	2.50	7.24	71	−36
36%	424.44	22	1.179	11.64	1.1	1.99	2.46	14.5	61	−30
38%	451.82	23	1.189	12.39	1.1	2.10	2.43	28.3	48	−26

The reference temperature and pressure for the above table are 20℃ and 1 atmosphere (101.325kPa).
Vapour pressure values are taken from the *Intemational Cntical Tables* and refer to the total vapour pressure of the solution.

Vocabulary

inorganic *adj.* 无机的
organometallic *adj.* 有机金属的
antimony *n.* 锑
bismuth *n.* 铋
calcium *n.* 钙
copper *n.* 铜
hydrogen *n.* 氢
chloride *n.* 氯化物
carbon tetrachloride 四氯化碳
mineral acid 无机酸
release *v.* 释放
dissolve *v.* 溶解
nitric *adj.* 含氮的
solvent *n.* 溶剂
quantity *n.* 数量
plant *n.* 工厂
property *n.* 性质，特性
deposit *n.* 沉淀物
element *n.* 元素
aluminium *n.* 铝
barium *n.* 钡
boron *n.* 硼
chlorine *n.* 氯
fluorine *n.* 氟
iron *n.* 铁
ammonium chloride 氯化铵
molecular formula 分子式
derive *v.* 采自
ion *n.* 离子
sulfuric *adj.* （正）硫的
soluble *adj.* 可溶的
feedstock *n.* 给料
manufacture *v.& n.* 制造
corrosive *adj.* 腐蚀性的
dilute *vt. adj.* 稀释，冲淡的
corrosion *n.* 腐蚀