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化学专业英语

——化学与社会

冯丽娟 李先国 主编

中国海洋大学出版社
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前　言

提高英语教学水平是当今我国高等教育面向现代化、面向世界、面向未来，适应经济全球化和科技革命并与国际接轨的基本要求，对学生专业英语交流能力的培养至关重要，因此，双语教学已成为高校教学改革的热点和重点，各高等院校都相继开设了双语课程。如何搞好专业英语以及双语课教学，提高学生综合素质和能力，培养开放型人才，是摆在高校和教师面前的一项紧迫任务。

多年的教学实践使我们深感选择合适的教材是保证教学质量的前提，正基于此，结合化学专业英语教学的实际情况和双语教学的实践经验，我们编写了这本教材。该书编排由浅入深，使学习化学知识与掌握专业英语融为一体，既适用于化学类及相关专业学生的化学专业英语教学或双语教学，也可以作为相关专业研究生、教师、科研人员的参考用书。

本书内容主要选材于国外化学类原版教材和专著，以当今社会最关注的环境、能源、材料、生命科学等问题与化学的联系为主线，介绍了化学这门应用相当广泛的学科与人类社会的密切关系。

全书分为两大板块，前一板块包括绪论和第 1，2 章，介绍了化学的基本概念、原理、发展历程、重要的化合物等等，侧重化学学科本身；后一板块包括第 3，4，5，6 章，主要涉及化学发展与社会进步、化学与日常生活、化学与环境、化学与现代技术，侧重与化学相关的学科和领域。每一章节都由相对独立的文章组成，文后附有重要词汇和短语注解，并对难度较大的语句给出了参考译文，以方便读者较准确了解和掌握化学专业英语词汇以及科技英语的表达方式。

该书由冯丽娟、李先国教授主编并审核修订，参加本书编写的有周晓（第 4，5，6 章）、范莹（第 1，5，6 章）、刘志强（第 2，4 章）、单红（第 3，4 章）、仉霞（第 1，3 章）、王振永（附录）。该书初稿于 2001 年完成，在实际教学中已试用三年；根据学生反馈的意见以及实际教学中出现的问题对书稿进行了部分修改和调整，使之更贴近学生，易于学习掌握。

本教材编写过程中，参阅了大量国内外资料和文献，在此向这些资料和文献的原作（编）者致以诚挚的谢意。

本书承济南大学孙国新教授、青岛大学李群教授审阅，中国海洋大学出版社为本书的写成和出版给予了很大的支持和帮助，在此表示衷心的感谢。

限于经验与水平，教材中不足之处在所难免，敬请读者批评指正，以便进一步改进和完善。

编　者

2006 年 2 月于青岛

Contents

Chapter 1 Introduction to Chemistry

1-1 What Is Chemistry

Chemistry is such a broad, all-encompassing area of study that people almost despair in trying to define it. Indeed, some have taken a cop-out approach by defining chemistry as "what chemists do". But that won't do; it's much too narrow a view.

Chemistry is what we all do. We bathe, clean, and cook. We put chemicals on our faces, hands, and hair. Collectively, we use tens of thousands of consumer chemical products in our homes. Professionals in the health and life sciences use thousands of additional chemicals as drugs, antiseptics, or reagents for diagnostic tests.[1]

Your body itself is a remarkable chemical factory. You eat and breathe, taking in raw materials for the factory. You convert these supplies into an unbelievable array of products, some incredibly complex. This chemical factory—your body also generates its own energy. It detects its own malfunctions and can regenerate and repair some of its component parts. It senses changes in its environment and adapts to these changes. With the aid of a neighboring facility, this fabulous factory can create other factories much like itself.

Everything you do involves chemistry. You read this sentence, light energy is converted to chemical energy. You think, protein molecules are synthesized and stored in your brain. All of us do chemistry.

Chemistry affects society as well as individuals. Chemistry is the language and the principal tool of the biological sciences, the health sciences, and the

agricultural and earth sciences.[2]

Chemistry has illuminated the entire natural world; from the tiny atomic nucleus to the immense cosmos.[3] We believe that knowledge of chemistry can help you. Chemistry can be related immediately to problems and opportunities in the life and health sciences. And we believe that this can make the study of chemistry interesting and exciting, especially to no chemists.

For example, an "ion" is more than a chemical abstraction. Enough mercury ions in the wrong place can kill you, but the right number of calcium ions in the right place can keep you from bleeding to death. "$pV=nRT$" is an equation, but it is also the basis for the respiratory therapy that has saved untold lives in hospitals. "Hydrogen bonding" is a chemical phenomenon, but it also helps to account for the fact that a dog has puppies while a cat has kittens and a human has human babies. There are hundreds of similar fundamental and interesting applications of chemistry to life.

Knowledge of chemistry has already had a profound effect on the quality of life. Its impact on the future will be even more dramatic. At present we can control diabetes, cure some forms of cancer, and prevent some forms of mental retardation because of our understanding of the chemistry of the body.[4] We can't cure diabetes or cure all forms of cancer or all mental retardation, because our knowledge is still limited.[5] So learn as much as you can. Your work will be enhanced and your life enriched by your greater understanding.

Be prepared. Something good might happen to you and to others because of you.

(Excerpted from *Chemistry and life: An Introduction to General, Organic, and Biological Chemistry* (5th Edition) edited by John W. Hill (1997))

New Words

encompass [in'kʌmpəs] *vt.* 包围,环绕
despair [dis'pɛə] *n.* & *vi.* 绝望,失望
antiseptic [ˌænti'septik] *n.* 防腐剂,杀菌剂
reagent [ri(:)'eidʒənt] *n.* 试剂
malfunction [mæl'fʌŋkʃən] *n.* 故障
cosmos ['kɔzməs] *n.* 宇宙
calcium ['kælsiəm] *n.* 钙

mercury ['mə:kjuri] *n*. 汞
protein ['prəuti:n] *n*. 蛋白质
cop-out [kɔp'aut] *n*. 逃避

Translation for Reference

(1) Professionals in the health and life sciences use thousands of additional chemicals as drugs, antiseptics, or reagents for diagnostic tests.
保健和生命科学的专家们用各种各样的化学品作为药物、杀菌剂或诊断测试的试剂。

(2) Chemistry is the language and the principal tool of the biological sciences, the health sciences, and the agricultural and earth sciences.
化学是生物学、保健科学、农业科学和地球科学的语言和基本工具。

(3) Chemistry has illuminated the entore natural world; from the tiny atomic nucleus to the immense cosmos.
从微小的原子核到无垠的宇宙,化学给整个自然界以启迪。

(4) At present we can control diabetes, cure some forms of cancer, and prevent some forms of mental retardation because of our understanding of the chemistry of the body.
因为我们对身体中与化学相关问题有所了解,目前,我们能控制糖尿病,治疗一些癌症并能预防某些精神迟钝症。

(5) We can't cure diabetes or cure all forms of cancer or all mental retardation, because our knowledge is still limited.
由于我们的知识仍然有限,所以我们不能治愈糖尿病、所有癌症或智力缺陷。

1-2 Modern Chemistry

In 1964 Bamett Rosenberg and his coworkers at Michigan State University were studying the effects of electricity on bacterial growth. They inserted platinum electrodes, or electrical connections, into a live bacterial culture and allowed an electric current to pass. After 1 to 2 hours, they noted that cell division in the bacteria stopped. The researchers were very surprised by this result, but even more surprised by the explanation. They were able to show that cell division was inhibited by a substance containing platinum, produced from

the platinum electrodes by the electric current.[1] A substance such as this one, the researchers thought, might be useful as an anti-cancer drug, because cancer involves runaway cell division. Later research confirmed this view, and today the platinum—containing substance cisplafin is a leading anti-cancer drug.

This story illustrates three significant reasons to study chemistry. First, chemistry has important practical applications. The development of lifesaving drugs is one, and a complete list would touch upon most areas of modern technology. Second, chemistry is an intellectual enterprise, a way of explaining our material world. When Rosenberg and his coworkers saw that cell division in the bacteria had ceased, they systematically looked for the chemical substance that caused it to cease. They sought a chemical explanation for the occurrence. Finally, chemistry figures prominently in other fields. Rosenberg's experiment began as a problem in biology; through the application of chemistry it led to an advance in medicine. Whatever your career plans, you will find your knowledge of chemistry is a useful intellectual tool for making important decisions.

All of the objects around you—the book, your pen or pencil, and the things of nature such as rocks, water, and plant and animal substances—constitute the matter of the universe. Each of the particular kinds of matter, such as a certain kind of paper or plastic or metal, is referred to as a material. We can define chemistry as the science of the composition and structure of materials and of the changes that materials undergo.

One chemist may hope that by understanding certain materials he or she will be able to find a cure for a disease or a solution for an environmental ill. Another chemist may simply want to understand a phenomenon. Because chemistry deals with all materials, it is a subject of enormous breadth. It would be difficult to exaggerate the influence of chemistry on modern science and technology or on our ideas about our planet and the universe.[2] Let's take a brief glimpse at modern chemistry and see some of the ways it has influenced technology, science, and modern thought.

For thousands of years, human beings have fashioned natural materials into useful products. Modern chemistry certainly has its roots in this endeavor. After the discovery of fire, people began to notice changes in certain rocks

and minerals exposed to high temperatures. From these observations came the development of ceramics, glass, and metals, which today are among our most useful materials. Dyes and medicines were other early products obtained from natural substances. For example, the ancient Phoenicians extracted a bright purple dye known as Tyrian purple, from a species of sea snail. One ounce of Tyrian purple required over 200,000 snails. Because of its brilliant hue and scarcity, the dye became the choice of royalty.

Although chemistry has its roots in early technology, chemistry as a field of study based on scientific principles came into being only in the latter part of the eighteenth century. Chemists began to look at the precise quantities of substances they used in their experiments. From this work came the central principle of modern chemistry: the materials around us are composed of exceedingly small particles called atoms, and the precise arrangement of these atoms into molecules or more complicated structures accounts for the many different characteristics of materials. Once chemists understood this central principle, they could begin to fashion molecules to order. They could synthesize molecules; that is, they could build large molecules from small ones. Tyrian purple, for example, was eventually synthesized from the simpler molecule aniline; Chemists could also correlate molecular structure with the characteristics of materials and so begin to fashion materials with special characteristics.

The liquid-crystal displays (LCD) that you see in watches, calculators, and similar devices are an example of an application that depends on the special characteristics of materials. The liquid crystals used in these displays are a form of matter intermediate in characteristics between those of liquids and those of solid crystals; hence the name. These liquid crystals are composed of rodlike molecules that tend to align themselves something like the wood matches in a matchbox. The liquid crystals are held between thin plates that align the molecules in a particular direction, giving the normal light-gray background of the display. These plates are covered with small electrodes, and when any one of them is electrified, the nearby molecules of the liquid crystal are realigned so that they point in a new direction, changing the gray in that area to black.

Chemists continue to develop new materials and to discover new properties of old ones. Electronics and communications, for example, have been

completely transformed by technological advances in materials. Optical-fiber cables have replaced long-distance telephone cables made of copper wire. Optical fibers are fine threads of extremely pure glass. Because of their purity, these fibers can transmit laser light pulses for miles compared with only a few inches in ordinary glass. Not only is optical-fiber cable cheaper and less bulky than copper cable carrying the same information, but by using different colors of light, optical-fiber cable can carry voice, data, and video information at the same time.[3] At the ends of an optical-fiber cable, devices using other new materials convert the light pulses to electrical signals and back, while computer chips constructed from still other materials process the signals.

Chemistry has also affected the way we think of the world around us. For example, biochemists and molecular biologists—scientists who study the molecular basis of living organisms—have made a remarkable finding: all forms of life appear to share many of the same molecules and molecular processes. Consider the information of inheritance, the genetic information that is passed on from one generation of organism to the next. Individual organisms, whether bacteria or human beings, store this information in a particular kind of molecule called deoxyribonucleic acid, or DNA for short.[4]

DNA consists of two intertwined molecular chains; each chain consists of links of four different types of molecular pieces, or bases. Just as you record information on a page by stringing together characters (letters, numbers, spaces, and so on), an organism stores the information for reproducing itself in the order of these bases in its DNA. In a multicellular organism, such as a human being, every cell contains the same DNA.

The atomic theory of matter, which forms the basis of modern chemistry, was the work of the British chemist John Dalton (1766—1844). Throughout his life, Dalton maintained an interest in the science of weather and climate. This interest led Dalton to study the atmosphere and to speculate on its fundamental structure, which eventually led him to his atomic theory.[5] If Dalton were alive today, he might well be involved in trying to answer some of the most urgent questions of our time: Is the earth's climate being irreversibly affected by the build-up of carbon dioxide in the atmosphere from fossil-fuel burning? What is the significance of the apparent depletion of ozone in the stratosphere over Antarctica?

(Excerpted from *General Chemistry* (5th Edition) edited by Darrell D. Ebbing (1996))

New Words

electricity [ilek'trisiti] *n.* 电,电学
bacteria [bæk'tiəriə] *n.* 细菌
platinum ['plætinəm] *n.* 铂
electrode [i'lektrəud] *n.* 电极
culture ['kʌltʃə] *n.* 培养
intellectual [ˌinti'lektjuəl] *adj.* 智力的,知识的
enterprise ['entəpraiz] *n.* 事业
cease [si:s] *vt.* 中断,停止
systematically [sistə'mætikəli] *adv.* 系统地
occurrence [ə'kʌrəns] *n.* 发生,出现;事件
prominent ['prəminənt] *adj.* 杰出的,重要的
plastic ['plæstik] *adj.* 塑料的
undergo [ˌʌndə'gəu] *vt.* 经历,经受,忍受
exaggerate [ig'zædʒəreit] *vt.* 夸大,放大
glimpse [glimps] *n.* 一瞥,一看
transmit [trænz'mit] *vt.* 传送
pulse [pʌls] *n.* 脉搏
bulky ['bʌlki] *adj.* 庞大的,笨重的
chip [tʃip] *n.* 薄片,芯片
construct [kən'strʌkt] *vt.* 建造;构筑
remarkable [ri'ma:kəbl] *adj.* 显著的
inherit [in'herit] *vt.* 继承,遗传
deoxyribonucleic acid (DNA) 脱氧核糖核酸
intertwine [ˌintə(:)'twain] *vt.* 缠结
string [striŋ] *n.* 细绳,带子
multicellular [ˌmʌlti'seljulə] *adj.* 多细胞的
fossil ['fɔsl] *n.* 化石
depletion [di'pli:ʃən] *n.* 用尽,缺乏,提取金属
stratosphere ['strætəusfiə] *n.* 平流层,同温层
Antarctica [æn'tɑ:ktikə] *n.* 南极洲

Translation for Reference

(1) They were able to show that cell division was inhibited by a substance containing platinum, produced from the platinum electrodes by the electric current.
他们能够证明电流通过铂电极产生的铂能抑止细胞分裂。

(2) It would be difficult to exaggerate the influence of chemistry on modern science and technology or on our ideas about our planet and the universe.
夸大化学对现代科学技术或对我们关于行星和宇宙的观点的影响都是困难的。

(3) Not only is optical-fiber cable cheaper and less bulky than copper cable carrying the same information, but by using different colors of light, optical-fiber cable can carry voice, data, and video information at the same time.
在传载同量信息时，光纤比铜电缆不仅便宜轻便，而且通过使用不同颜色的光，光纤还可以同时传递声音、数据和视频信息。

(4) Individual organisms, whether bacteria or human beings, store this information in a particular kind of molecule called deoxyribonucleic acid, or DNA for short.
个体生物，无论是细菌还是人类，都将这种信息储存在一种叫做脱氧核糖核酸(简写为 DNA)的特殊分子中。

(5) This interest led Dalton to study the atmosphere and to speculate on its fundamental structure, which eventually led him to his atomic theory.
在这种兴趣的驱动下，道尔顿研究大气并推测它的基本结构，最后创立了其原子理论。

1-3 Matter, Element, Compound and Mixture

If you're planning to be an engineer, you can be sure that many of the materials you will work with have been synthesized by chemists. Some of these materials are organic (carbon-containing). They could be familiar plastics like polyethylene or the more esoteric plastics used in unbreakable windows and nonflammable clothing.[1] Other materials, including metal alloys, semiconductors, and superconductors, are inorganic in nature.

Perhaps you are a health science major, looking forward to a career in medicine or pharmacy. If so, you will want to become familiar with the properties of aqueous solutions, which include blood and other body fluids. Chemists have made many life-saving products over the past few decades. These range from drugs used in chemotherapy to new antibiotics used against resistant microorganisms.[2]

Matter is anything that has mass and occupies space. It exists in three phases: solid, liquid, and gas. A solid has a rigid shape and a fixed volume. A liquid has a fixed volume but is not rigid in shape; it takes on the shape of the container. A gas has neither a fixed volume nor a rigid shape; it takes on both the volume and the shape of the container.

Matter can be classified into two categories: pure substances and mixtures. Pure substances are either elements or compounds, while mixtures can be either homogeneous or heterogeneous (see Figure 1-3-1).

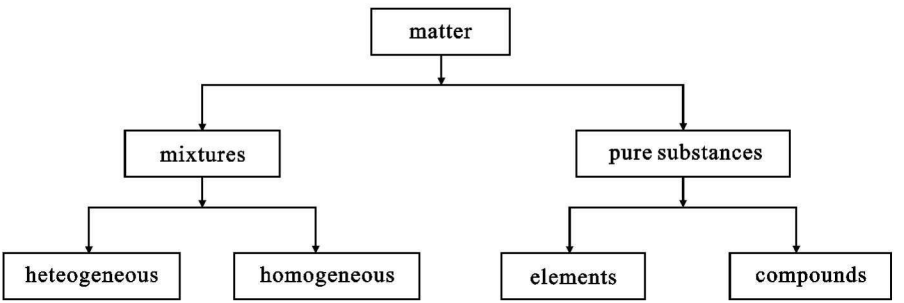

Figure 1-3-1 The Classification of Matter

An element is a type of matter which cannot be broken down into two or more pure substances. Many elements are familiar to all of us. The charcoal used in outdoor grills is nearly pure carbon. Electrical wiring, jewelry, and water pipes are often made from copper, a metallic element. Another such element, aluminum, is used in many household utensils. The shiny liquid in the thermometers you use is still another metallic element, mercury.

Some elements come in and out of fashion, so to speak. Fifty years ago, elemental silicon was a chemical curiosity. Today, ultrapure silicon has become the basis for the multibillion-dollar semiconductor industry. Lead, on the other hand, is an element moving in the other direction. A generation ago