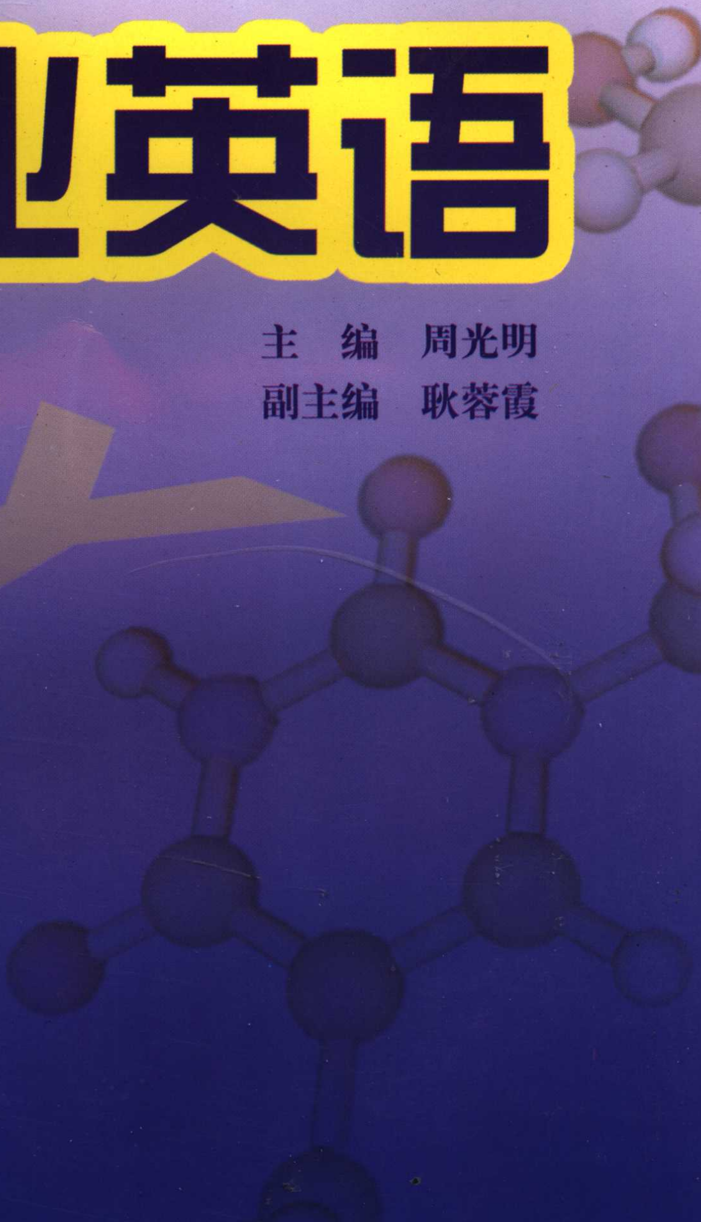
21世纪高等学校专业英语教材

化学专业英语

主　编　周光明
副主编　耿蓉霞

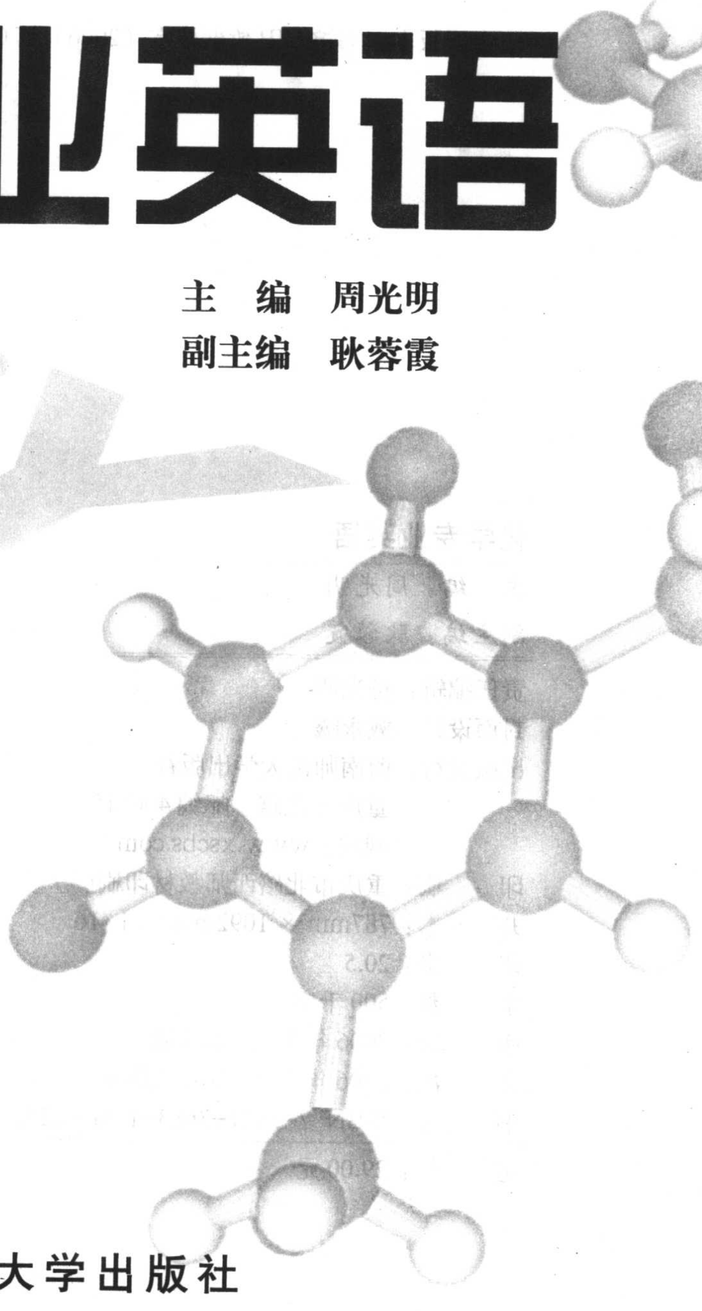


西南师范大学出版社

21世纪高等学校专业英语教材

化学专业英语

主　编　周光明
副主编　耿蓉霞



西南师范大学出版社

图书在版编目（CIP）数据

化学专业英语／周光明主编.—重庆：西南师范大学出版社，2006.7

ISBN 7-5621-3683-1

Ⅰ.化… Ⅱ.周… Ⅲ.化学—英语—高等学校—教材 Ⅳ.H31

中国版本图书馆CIP数据核字（2006）第081658号

化学专业英语

主　编：周光明

副主编：耿蓉霞

责任编辑：杨光明

封面设计：戴永曦

出版发行：西南师范大学出版社

重庆·北碚　邮编400715

网址：www.xscbs.com

印　刷：重庆市北碚西师教材印刷厂

开　本：787mm × 1092mm　1/16

印　张：20.5

字　数：500千字

版　次：2006年7月　第1版

印　次：2006年7月　第1次印刷

书　号：ISBN 7-5621-3683-1/G·2242

定　价：29.00元

前　言

《化学专业英语》课程已成为化学、化工等相关学科本科生掌握专业英语的必修课。如何在短时间内迅速掌握最基本的词汇、表达方式、常用语句，并能学习到学科前沿知识，是目前困扰化学专业英语学习者的主要问题。因而，许多学校在开设化学双语教学时感到十分困难，考研的学生也无法面对老师提出的化学专业英语问题。基于这些原因，我们精心组织编写了这本教材。

本书共32课和14个附录，均取材于美国大学教科书和专业资料。内容涉及无机化学、分析化学、环境化学、环境工程、有机化学、物理化学、材料化学。尤其专业前沿知识和附录是本书的一大特色。诺贝尔化学奖(1901－2005)获得者及其成就会激励学生；无机、有机、分析和物化领域常用专有名词可使学生在短时间内掌握专业英语术语；前缀和后缀对学生英语构词有快捷实用的帮助；有机词尾可助学生迅速扩充专业词汇；某些结构的读法可使学生增强口语能力；仪器的英文对照可帮助学生应用。

总之，本书内容丰富，取材有代表性和前沿性，也是一本难得的化学专业英语资料，适合综合性大学、师范大学及其他本科院校化学化工专业的师生使用或参考。

由于我们水平有限，不妥和疏漏也恐难免，还望读者多提宝贵意见。

周光明

2006年5月于重庆北碚

Table of contents

1 What Is Chemistry?

History of chemistry

1. Chemistry is a science that tries to understand the properties of substances and the changes that substances undergo. It is concerned with substances that occur naturally — the minerals of the earth, the gases of the air, the water and salts of the seas, the chemicals found in living creatures and also with new substances created by humans. It is concerned with natural changes — the burning of a tree that has been struck by lightning, the chemical changes that are central to life — and also with new transformations invented and created by chemists.
2. Chemistry has a very long history. In fact, human activity in chemistry goes back to prerecorded times.
3. As the quotation at the head of this chapter indicates, chemists are involved in two different types of activity. Some chemists investigate the natural world and try to understand it, while other chemists create new substances and new ways to perform chemical changes that do not occur in nature. Both activities have gone on since the first appearance of humans on earth, but the pace has increased enormously in the last century or so.
4. Curiosity about natural substances led to some of the earliest adventures in isolating pure chemical materials from nature. Humans discovered that they could extract the colors from flowers and some insects and use them to make pictures and to dye cloth. Only in the last century have chemists learned the detailed chemical structures of these natural colors. From earliest times humans have also been making new substances by performing chemical transformations. The first such new substances were probably soap and charcoal.
5. When wood is heated it loses water and produces charcoal. In this process the cellulose of wood — a chemical compound containing carbon, hydrogen, and oxygen all linked by chemical bonds — undergoes a chemical reaction that breaks the hydrogen and oxygen away as water and leaves the carbon behind as charcoal. A major chemical change has occurred — the process cannot be reversed to make cellulose again by just mixing the charcoal with water, since the oxygen and hydrogen atoms will not spontaneously form the needed bonds to carbon. Charcoal burns with a flame hotter than that of wood. Archaeological records indicate that charcoal has been used since prehistoric times.
6. Perhaps even earlier came the creation of soap. Soap is not a natural substance, but it can be made by heating fats with alkali to break some chemical bonds that link fatty acids to glycerin. Soaps are just the alkali salts of the resulting fatty acids. Since alkalis are formed when wood burns and are found in the ashes of wood fires, it is believed that the earliest humans noticed the unusual substances produced from fats that had dripped onto cooking fires.

7. These early "Chemists" made such discoveries by accident, and for a long time accident was the principal means of discovery. Accident still remains important to discovery, but with our increasing chemical understanding we now usually create new chemical substances by design.
8. After the early period of random discovery, humans began heating substances together intentionally to see what occurs. When a material that we now call iron ore was heated with charcoal, it produced iron metal, a new substance (we now use coke, produced from coal, instead of charcoal). Iron ore contains a chemical in which iron atoms are chemically bound to oxygen atoms. Heating it with charcoal lets the carbon atoms of charcoal bind to the oxygen atoms and carry them off as the gas carbon monoxide, leaving iron behind. Only gold and some metals related to platinum occur naturally as metals; all others are made from their ores by such chemical processes.
9. When copper and tin were heated together, the copper atoms and tin atoms linked up with metallic bonds, producing the alloy bronze, which is harder than either copper or tin. In the Bronze Age, starting at about 3600 BC, the hardness of this metallic alloy made it the dominant material for tools and weapons. Bronze was the first metal that could hold a sharp edge.
10. Egyptians made glass as early as 1400 BC by heating some natural minerals together. Glass is formed when this heating caused major chemical changes.
11. Much of the rise of civilization has involved humans creating new substances by transforming natural ones to better meet their needs. Tanning hides to make leather, for example, changes their chemical nature. Even cooking foods alters their chemical structures. Every substance in the world is made up of "chemicals", either in the form of chemical compounds in which atoms are linked by chemical bonds or, in a few cases such as helium gas, as unlinked atoms. No substance can be called "chemical-free". Indeed, "natural" chemicals do not always have advantages. Some of the most dangerous poisons known are natural chemicals, produced by bacteria and other living things.
12. Modern chemistry is devoted to understanding the chemical structures and properties of natural chemicals and of chemicals created by building on what nature has supplied. The remainder of this book will describe many of the contributions to everyday life resulting from this knowledge, and a sample of what is left to be done by the current and future generations of chemists.

Fundamental principle of chemistry

13. The first and most important principle is that chemical substances are made up of molecules in which atoms of various elements are linked in well-defined ways. The second principle is that there are somewhat more than 100 elements, which are listed in the periodic table of the elements. The third principle is that those elements, arranged according to increasing numbers of protons in their nuclei, have periodic properties. That is, as the elements increase in their atomic number (number of protons in the nucleus), every so often and element appears that is similar in its properties to one that has occurred earlier in the table. For example, after lithium, with three protons in the nucleus, come other elements whose properties are decreasingly like those of lithium until suddenly sodium appears, with a nucleus containing 11 protons. Sodium is quite similar to lithium in many respects. The arrangement of the periodic table puts

such similar elements below each other in columns. Chemical reactions that lithium undergoes will also occur with sodium, although not with the same speed or energy; lithium and sodium are similar, but not identical.

14. Another principle is that the ways in which atoms are linked strongly affects the properties of chemical substances. This is particularly evident when covalent links (bonds) are involved. Covalent bonds, in which two atoms are held together by a pair of electrons shared between them, are the bonds that hold the atoms of carbon, oxygen, and hydrogen together in cellulose, for instance. Most covalent bonds do not break easily, which is why intense heating is needed to turn cellulose into charcoal. The precise arrangement of the links determines chemical properties. By contrast, a salt such as sodium chloride has what are called ionic bonds. The sodium and the chlorine are not directly linked, just held together by the attraction of the positive sodium ion for the negative chloride ion. When sodium chloride is dissolved in water, the sodium ion and the chloride ion drift apart.

15. There is another much more subtle difference among chemical structures that has to do with the three-dimensional arrangement of atoms in space. Two chemicals can differ, even when all the same atomic linkages are present, if the spatial arrangements are different. Differences in spatial arrangement can have several aspects, but the most interesting has to do with handedness, or what chemists call chirality. When a carbon atom carries four different chemical groupings, there are two different ways they can be arranged. For example, in the amino acid alanine the central carbon atom carries four different groups: a hydrogen atom, a nitrogen atom, and two carbon atoms that differ in what is attached to them.

[引自《化学的今天和明天》]

Vocabulary

be concerned with 参与,干预
be concerned about 关心,挂念
mineral ['minərəl] *n.* 矿物,矿石
chemical ['kemikəl] *adj.* 化学的 *n.* 化学制品,化学药品
creature ['kriːtʃə] *n.* 人,动物
strick [straik] *vt.* 打;击;捶击
lightning ['laitniŋ] *n.* 闪电 *adj.* 闪电的,快速的
transformation [ˌtrænsfə'meiʃən] *n.* 变化,转化,改革,转换
go back to 回去
prerecord ['priːri'kɔːd] *vt.* 预先录制
times ['taimz] *n.* 时期,次,倍数,乘
quotation [kwəu'teiʃən] *n.* 引用语,价格,报价单,行情表
be involved in 涉及,专心
go on 继续下去,过去,发生,进行
or so 左右,上下,大约
curiosity [ˌkjuəri'ɔsiti] *n.* 好奇心
lead to 导致,产生,通向
adventure [əd'ventʃə] *n.* 冒险,冒险的经历 *v.* 冒险
isolate ['aisəleit] *vt.* 使隔离,使孤立,使绝缘,离析 *n.* 隔离种群
colors ['kʌləs] *n.* 色料,着色剂,颜料
insect ['insekt] *n.* 昆虫,卑鄙的人 *adj.* 虫的
dye [dai] *n.* 染料,染色 *vt.* 染 *v.* 染

cloth[klɔ(:)θ]*n.* 布，织物，衣料
soap[səup]*n.* 肥皂 *vt.* 用肥皂洗
charcoal['tʃɑ:kəul]*n.* 木炭
cellulose['seljuləus]*n.* 纤维素 *adj.* 细胞的
spontaneously [spɔn'teiniəsli] *adv.* 自然地，本能地
archaeological[ˌɑ:kiə'lɔdʒikəl] *adj.* 考古学的，考古学上的
prehistoric['pri:his'tɔrik]*adj.* 史前的，陈旧的
fat[fæt]*n.* 脂肪，肥肉 *adj.* 肥大的，丰满的，肥的，胖的，油腻的 *n.* 文件分配表
alkali['ælkəlai]*n.* 碱 *adj.* 碱性的
glycerin['glisərin]*n.* 甘油，丙三醇
alkalis['ælkəlis]*n.* 碱金属
cooking['kukiŋ]*n.* 烹饪
by accident 偶然
principal['prinsəp(ə)l, -sip-]*n.* 负责人，首长，校长，主犯，本金 *adj.* 主要的，首要的
design[di'zain]*n.* 设计 *v.* 设计，计划，谋划，构思
random['rændəm]*n.* 随意，任意 *adj.* 任意的，随便的，胡乱的 *adv.* 胡乱地
intentionally [in'tenʃənəli] *adv.* 有意地，故意地
iron ore 铁矿石
coke[kəuk]*n.* 可乐，焦炭 *v.* (使)成焦炭
link up 连接，会合
alloy['ælɔi]*n.* 合金 *vt.* 使成合金，减低成色
bronze[brɔnz]*n.* 青铜(铜与锡合金)，铜像 *adj.* 青铜色的
dominant['dɔminənt]*adj.* 有统治权的，占优势的，支配的 *adj.* [生物]显性的
sharp edge 薄边
civilization[ˌsivilaɪ'zeiʃən; -lɪ'z-]*n.* 文明，文化，文明社会
tanning['tæniŋ]*n.* 制革法，皮肤晒成褐色
hide[haid]*n.* 兽皮，皮革 *v.* 剥...的皮，痛打，隐藏，掩藏，隐瞒，掩饰
poison['pɔizn]*n.* 毒药 *vt.* 毒害，败坏，使中毒 *vi.* 放毒，下毒
bacteria[bæk'tiəriə]*n.* 细菌
be devoted to 致力于
remainder[ri'meində]*n.* 残余，剩余物 v. 廉价出售 *adj.* 剩余的，出售剩书的
proton['prəutɔn]*n.* 质子
nuclei['nju:kliai]*n.* 核 (nucleus 的复数形)
identical[ai'dentikəl]*adj.* 同一的，同样的
evident['evidənt]*adj.* 明显的，显然的
drift apart (两者)漂移，疏远
subtle['sʌtl]*adj.* 敏感的，微妙的，精细的，稀薄的
handedness [ˋhændidnis] n. 手性，螺旋性
chirality['tʃirəliti]*n.* 手征，手性
amino acid 氨基酸
alanine['æləˌni:n]*n.* 丙胺酸
be attached to 附属于，喜爱

Translation

1. 什么是化学?

化学的历史

1. 化学是一门试图了解物质的性质和物质发生反应的科学。它涉及存在于自然界的物质：地球上的矿物，空气中的气体，海洋里的水和盐，在动物身上找到的化学物质以及由人类创造的新物质。它涉及自然界的变化——因闪电而着火的树木，与生命有关的化学变

化——还有那些由化学家发明和创造的新变化。

2. 化学的历史悠久。事实上，人类的化学活动可追溯到有历史记载以前的时期。

3. 正如本章一开始所指出的那样，化学包含着两种不同类型的活动。有些化学家在研究自然界并试图了解它，同时另一些化学家则在创造自然界不存在的新物质和完成化学变化的新途径。自人类出现在地球上那一刻起，这两方面的活动就都有了，但是在上一个世纪以来它们的步伐大大地加快了。

4. 对自然界物质的好奇心，使得人们很早就在从自然界分离纯粹化学物质方面进行了大胆探索。人们已经发现，可以从花卉和某些昆虫提取颜料，并用来作画和染布。直到上个世纪，化学家才弄清楚这些天然颜料的详细化学结构。人类很早就在通过化学变化来制造新物质，这类新物质中，最早的可能是肥皂和活性炭。

5. 加热木材时，它将失去水分并生成活性炭，在这个过程中，木材中的纤维素——一种含有碳、氢和氧，并全由化学键连结在一起的化合物发生了化学反应，使氢和氧断裂下来变成水而失去，剩下的碳成为活性炭。这是发生的主要化学变化。但是，仅靠把活性炭和水混在一起，不能使这个过程反过来生成纤维素。因为氧原子和氢原子不能自发地与碳生成所需的键。活性炭燃烧时的火焰温度比木材要高。考古文献表明，活性炭在史前时期已经得到应用。

6. 肥皂的出现可能还要早些。肥皂不是一种天然产物，但它可以通过加热脂肪和碱使连接脂肪酸和甘油的某些键断裂的办法来制造。肥皂就是脂肪酸和碱生成的盐。因为木材燃烧时能够生成某些碱，这在木材燃烧后的灰烬中可以找到。所以人们相信，古代人类是从脂肪滴到烹调时的火焰上以后，才开始注意到所产生的这种不寻常的物质的。

7. 早期的这些“化学家们”的发现多属于偶然，而且在相当长的时间里，偶然性是发现的主要途径。偶然性对于发现至今仍然是重要的，但是随着人们化学知识的增长，现在我们经常通过设计来创造新的化学物质。

8. 当有了早期的随机发现的经验之后，人类开始有意识地将物质放在一起加热，看看会出现些什么。当一种我们现在称之为铁矿的物质和木炭一起加热时，产生了一种新物质金属铁（我们现在用由煤生产的焦炭来代替木炭）。铁矿中含有一种化合物，其中的铁原子是和氧原子化合在一起的。当和木炭一起加热时，让木炭中的碳原子和氧原子结合并以一氧化碳气体的形式把它们带走，遗留下来的就是金属铁。以金属形式天然存在的只有金和与铂相关的一些金属，其他所有的金属都是通过这类化学过程从它们的矿石中得到的。

9. 当铜和锡一起被加热时，铜原子和锡原子以金属键相连接，生成青铜合金，它比铜或锡都硬。在公元前大约3600年的青铜时代，这种金属合金的坚硬使得它成为制造工具和武器的主要材料。青铜曾经是第一种能够保持锋利边缘的金属。

10. 埃及人早在公元前1400年就会通过把一些天然矿物共热制造玻璃，当加热使主要反应发生时，就生成了玻璃。

11. 文明的进步涉及人类创造新物质以满足需要，而这些新物质则是由天然物质转变而成的。例如，把皮革染成褐色，已改变了它的化学性质。即使是烹调食物，也会改变它们的化学结构。这个世界上的万物都是由“化学物质”构成的，或者以化合物的形式存在，其中的原子以化学键连结在一起；或者在少数情况下以未与其他原子连结的形式存在，如氦气。没有可以称之为“与化学物质无关”的物质。实际上，“天然”化学物质并不总是

对人有益的。已知由微生物和其他生物产生的某些天然化合物,就属于最危险的毒物之列。

12. 现代化学致力于了解天然化合物的化学结构、性质和制造自然界已有的化合物构成的化学物质。本书的其他部分将从这些知识出发,介绍化学对日常生活所作的许多贡献,并举一些例子来加以说明,还有哪些问题是今天和明天的化学家将要解决的。

化学基本原理

13. 第一条也是最重要的原理是,化学物质是由分子组成的,分子中的不同元素的原子是以一定的方式连结在一起的。第二条原理是,现在已有大约 100 多种元素被排列在元素周期表中。第三条原理是,这些元素是按照它们核内质子数目的递增而排列的,表现出周期性。亦即,当这些元素的原子序数(核内的质子数)增加时,每个元素经常表现出和已排在周期表中的某个元素有相似的性质。例如,在核中有 3 个质子的锂之后,接下来的元素的性质和锂的相似程度递减,直至核中有 11 个质子的钠出现后又变得相似起来。锂和钠在许多方面十分相似。周期表在排列时,把这类相似的元素排成一列。锂所发生的反应,钠也会发生,虽然速率和能量不同;锂和钠只是相似而不是完全相同。

14. 还有一条原理是,原子连结的方式将强烈地影响着化学物质的性质。当包含有共价(键)时特别明显。形成共价键时,两个原子靠它们之间公用的一对电子把它们连结在一起。例如,纤维素中连结碳原子、氧原子和氢原子的键就是共价键。大多数共价键是不容易断裂的,这就是为什么要把纤维素变成活性炭需要强热的原因。化学键的精细排列决定着化学性质。与此相反,像氯化钠一类的盐类则含有所谓的离子键。钠和氯不是直接连结在一起的,是靠带正电的钠离子和带负电的氯离子相吸引在一起的。当氯化钠溶于水时,钠离子和氯离子就各自分开了。

15. 至于原子在空间里的三维排列的化学结构之间、还要考虑更为精细的差别。两种化学物质间,即使存在着完全相同的原子键合,只要空间排列不同,这两种化学物质就可以区分开来。空间排列的差别可以有许多方面,但是最有趣的是手对称性,化学家称之为手性。当一个碳原子与 4 个不同的原子(团)相连时,有两种不同的空间排列方式,例如,丙胺酸的中心碳原子与 4 个不同的原子(团)相连:1 个氢原子,1 个氮原子和 2 个不同的基团的碳原子。

2 The Atomic Theory and the Periodic Table

The atomic theory

1. The classification of matter as mixture and substances, compounds and elements, is central to modern chemistry. It helps us to systematize many chemical facts. However, it also raises a number of questions. Why is one element different from another? Why is a compound different from a mixture? Why do elements combine to form compounds? These questions are connected with the facts that we have already discussed. We need a theory to help us explain these facts. We therefore shift our attention now to a discussion of our present theory of matter, the atomic theory. We will find that this theory provides answers to the questions we have raised.
2. The seeds of the atomic theory go back at least to the time of the ancient Greeks. The Greeks pondered a seemingly abstract question: Can matter be divided endlessly into smaller and smaller pieces, or is it composed of some ultimate particle that cannot be further divided? The main line of Greek thought, following the views of Plato and Aristotle, was that matter is continuous. However, some Greek philosophers, notably Democritus, disagreed with this view and argued that matter was composed of small indivisible particles that Democritus called atomos, meaning indivisible. This atomic concept was also central to the natural philosophy of the Roman poet and philosopher Lucretius, who lived in the first century B. C.. He wrote a famous poem, De Rerum Natura (On the Nature of Things), in which he elaborated at length on the atomic view of matter.
3. Even if it were granted that matter is atomic in nature, the question arises how the atoms of different substances differ from one another. Lucretius suggested that the atoms of substances that have a bitter taste have barbs on their surface that scrape the tongue, whereas the atoms of substances with a bland taste must have a smooth surface. Not much improvement in the atomic view of matter occurred in the 18 centuries following Lucretius. The philosophical ideas of Plato and Aristotle, neither of whom accepted the atomistic view of matter, held sway in European thought for many centuries. Even though the atomic idea was occasionally revived, early proponents of the particulate theory of matter relied largely on intuition to support their views. During this long period, however, there was a thin, intermittent stream of experimental work. Much of it was prompted by erroneous notions, such as the alchemical belief that common metals such as lead might be transformed into precious metals. Nevertheless, experience of how chemical substances react with one another were accumulated, and more quantitative methods of studying chemical reactions were developed. The way was prepared for a new and more meaningful statement of an atomic theory. It came, in the early years of the nineteenth century, from John Dalton, an English schoolteacher. Dalton's atomic theory, published in the period 1803 – 1807, was strongly tied to experimental observation. His efforts were so successful

that his theory has dominated our thinking since his time and has had to undergo little revision.

4. The basic postulates of Dalton's theory were as follows:

(1) Each element is composed of extremely small particles called atoms.

(2) All atoms of a given element are identical.

(3) Atoms of different elements have different properties (including different masses).

(4) Atoms of an element are not changed into different types of atoms by chemical reactions; atoms are neither created nor destroyed in chemical reactions.

(5) Compounds are formed when atoms of more than one element combine.

(6) In a given compound, the relative number and kind of atoms are constant.

5. This theory provides us with a mental picture of matter. We visualize an element as being composed of tiny particles called atoms. Atoms are the basic building blocks of matter; they are the smallest units of an element that can combine with other elements. Compounds involve atoms of two or more elements combined in definite arrangements. Mixtures do not involve the intimate interactions between atoms that are found in compounds.

6. Dalton's theory embodies several simple laws of chemical combination that were known at the time. Because atoms are neither created nor destroyed in the course of chemical reactions (postulate 4), it is readily evident that matter is neither created nor destroyed in such reactions. Thus we have the law of conservation of matter, which was discovered by Lavoisier. The law of constant composition is explained by postulate 6: In a given compound the relative number and kind of atoms is constant. A third law discovered by Dalton and consistent with his theory is the law of multiple proportions: when two elements form more than one compound, for a fixed mass of one element the masses of the second element are related to each other by small whole numbers. For example, the substances water and hydrogen peroxide, both consist of the elements hydrogen and oxygen. In water there are 8.0 g of oxygen for each gram of hydrogen, whereas in hydrogen peroxide there are 16.0 g of oxygen for each gram of hydrogen. The ratio of the masses of oxygen that combine with a gram of hydrogen in these compounds is in the ratio of the small whole number two: hydrogen peroxide has twice as much oxygen per unit mass of hydrogen as water does. Using the atomic theory, we understand this to mean that hydrogen peroxide contains twice as many oxygen atoms per hydrogen atom as does water. We now know that water contains one oxygen atom for each two hydrogen atoms, whereas hydrogen peroxide contains two oxygen atoms.

7. Thus we see that the atomic theory ties together many observations and helps us explain them. To our earlier question of what makes one element different from another, we can now answer that they have different types of atoms. However, this explanation only begs a further question: How are the atoms of different elements different from each other? We need to consider the structure of the atom to answer this question. This topic is taken up in the next section. We will see that as we begin to understand the structure of the atom, we will begin to understand many more aspects of matter.

8. On the atomic level, gold, oxygen, and carbon differ in terms of the number of protons, neutrons, and electrons their respective atoms contain. These subatomic particles, however, are

common to all substances. We can therefore state that an atom is the smallest representative sample of an element, because breaking the atom into subatomic particles destroys its identity.

9. In order to change a base or common metal like lead, atomic number 82, to gold, atomic number 79, requires removal of three protons from the nucleus of the lead atom. Because the nucleus is extremely small and buried in the heart of the atom, and because of the very strong binding forces between particles in the nucleus, this removal is exceedingly difficult. The energies required to cause changes in the nucleus are enormously greater than the energies associated with even the most vigorous chemical reactions. Thus, we still agree with Dalton that atoms of an element are not changed into different types of atoms by chemical reactions. Therein lies the futility of the alchemists' attempts to change base metals to gold.

The periodic table

10. Dalton's atomic theory, and the various empirical laws that it helped to explain, set the stage for a vigorous growth in chemical experimentation during the early part of the nineteenth century. As the body of chemical observations grew, and the list of known elements expanded, attempts were made to find regularities in chemical behavior. These efforts culminated in the development of the periodic table in 1869.

11. Many elements show very strong similarities to each other. For example, lithium (Li), sodium (Na), and potassium (K) are all soft, very reactive metals. The elements helium (He), neon (Ne), and argon (Ar) are very nonreactive gases. If the elements are arranged in order of increasing atomic number, their chemical and physical properties are found to show a repeating or periodic pattern. The arrangement of elements in order of increasing atomic number, with elements having similar properties placed in vertical columns, is known as the periodic table.

12. The elements in a column of the periodic table are known as a family or group. They are identified as group 1A, 2A, and so forth, as shown at the top of the periodic table. For example, three familiar elements that have similar properties are copper (Cu), silver (Ag), and gold (Au), which occur together in group 1B. The members of group 1A — lithium, sodium, potassium, rubidium (Rb), cesium (Cs), and francium (Fr) — are known as the alkali metals. The members of group 2A — beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and radium (Ra) — are known as alkaline earth metals. The members of group 7A — fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At) —are known as the halogens. The members of group 8A — helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn) — are known as the noble gases, inert gases, or rare gases.

[引自 **Brown, LeMay. Chemistry—The Central Science**]

Vocabulary

systematize['sistimətaiz] *v.* 系统化 *vt.* 使...系统化，把...分类
seed [si:d] *n.* 种子
ancient['einʃənt] *adj.* 远古的，旧的
ponder['pɔndə] *v.* 沉思，考虑
seemingly['si:miŋli] *adv.* 表面上地
ultimate['ʌltimit] *adj.* 最后的 *n.* 最终
Plato['pleitəu] *n.* (427 - 347 BC，古希腊哲学家)柏拉图
Aristotle['æristɔtl] *n.* 亚里斯多德(古希腊大哲学家，科学家)
Democritus [di'mɔkritəs] *n.* 德谟克利特(约公元前460 - 370，古希腊哲学家)
poet['pəuit, 'pəuet] *n.* 诗人
Lucretius[lu:'kri:ʃiəs]卢克莱修(罗马哲学家、诗人)
elaborate[i'læbərət] *adj.* 详细阐述的 *vt.* 详细阐述
at length *adv.* 最后，详细地
grant[gra:nt] *vt.* 同意，承认(某事为真)~ *n.* 同意，假定
bitter taste 苦味
barb[ba:b] *n.* 鱼钩，倒刺
scrape[skreip] *n.* 刮，*vi.* 刮掉 *vt.* 刮
bland[blænd] *adj.* 温和的，刺激性少的
Aristotle['æristɔtl] *n.* 亚里斯多德(古希腊大哲学家，科学家)
atomistic[,ætə'mistik] *adj.* 原子论的
held sway in 统治，支配
revived[ri'vaivd] *adj.* 复活的
proponent[prə'pəunənt] *n.* 建议者 *adj.* 建议的
particulate[pə'tikjulit, -leit] *n.* 微粒 *adj.* 微粒的
intuition[,intju(:)'iʃən] *n.* 直觉，直觉的知识
intermittent stream 间歇河
prompt[prɔmpt] *n.* 提示 *vt.* 促使 *adj.* 敏捷的 *adv.* 准时地
erroneous[i'rəunjəs] *adj.* 错误的
notion['nəuʃən] *n.* 概念
alchemical['ælkimikəl] *adj.* 炼金术的
belief[bi'li:f] *n.* 信任，信仰
precious metal 贵金属
meaningful['mi:niŋful] *adj.* 意味深长的
Dalton['dɔ:ltən] *n.* 道尔顿(英国化学家、物理学家，1766 - 1844)
dominate['dɔmineit] *v.* 支配，占优势
revision[ri'viʒən] *n.* 修订
postulate['pɔstjuleit] *n.* 假定 *vt.* 假定 *vi.* 要求
mental['mentl] *adj.* 精神的
visualize['vizjuəlaiz, 'viʒ -] *vt.* 形象化，想象 *vi.* 显现
definite['definit] *adj.* 明确的，一定的
intimate['intimit] *adj.* 亲密的 *vt.* 明白表示 *n.* 熟友
embody[im'bɔdi] *vt.* 使具体化
conservation[,kɔnsə(:)'veiʃən] *n.* 保存，守恒
Lavoisier [,la: vwə'zjei] 拉瓦锡(Antoine Laurent，1743 - 1794，法国化学家，氧发现者)
consistent[kən'sistənt] *adj.* 一致的
peroxide[pə'rɔksaid] *n.* 过氧化物
beg[beg] *v.* 请求，乞求
proton['prəutɔn] *n.* 质子
neutron['nju:trɔn] *n.* 中子
subatomic['sʌbə'tɔmik] *adj.* 亚原子的，次原子的
lead[li:d] *n.* 铅
nucleus['nju:kliəs] *n.* 核子[复数 nuclei]
be buried in 埋头于
vigorous['vigərəs] *adj.* 精力旺盛的
therein[ðεər'in] *adv.* 在那里，其中
futility[fju:'tiləti] *n.* 无益
alchemist['ælkimist] *n.* 炼金术士

empirical[em'pirikəl]*adj.* 经验主义的，实验式

regularity[ˌregju'læriti]*n.* 规律性

culminate['kʌlmineit]*v.* 达到顶点

atomic number 原子序数

pattern['pætən]*n.* 模式 *vt.* 模仿，仿造 *vi.* 形成图案

vertical['və:tikəl]*adj.* 垂直的，直立的 *n.* 垂直面，竖向

column['kɔləm]*n.* 圆柱，纵队

periodic table（元素）周期表

alkaline['ælkəlain]*adj.* 碱的，碱性的 *n.* 碱性

inert[i'nə:t]*adj.* 无活动的，惰性的

noble['nəubl]*adj.* 贵族的；显贵的，惰性的

rare[rɛə]*adj.* 稀罕的 *adv.* 非常

Translation

2. 原子论和周期表

原子论

1. 物质的分类如混合物和纯净物，化合物和元素，是近代化学的核心。它帮助我们将很多化学事实系统化。但它也引出了许多问题。为什么一种元素与另一种元素不同？为什么化合物与混合物不同？为什么元素能形成化合物？这些问题都与我们所讨论过的事实相联系。我们需要一种理论来帮助我们解释这些事实。因此，现在我们要将注意力转移到当今物质理论、原子论的讨论上。我们将会发现这一理论对我们所产生的问题给出了答案。
2. 原子论的起源至少可以追溯到古希腊时代，古希腊人思考着一个表面上看来很抽象的问题：物质可以无限止地细分为越来越小的片断吗，或它是由某些不能再分割的最终微粒组成的吗？遵循柏拉图和亚里斯多德的观点，希腊人的主要思路认为物质是连续的。但是，一些希腊哲学家，特别值得注意的是德谟克利特，不同意这一观点，并坚持认为物质是由很小的不能再分的微粒构成的，德谟克利特把这种微粒称为原子，意思是不可分割。这一原子概念，也是罗马诗人和哲学家卢克莱修的自然哲学的核心，卢克莱修生活在公元前1世纪。他写了一首著名的诗，De Rerum Natra（关于事物的本质），在这首诗里他精心、详细地描述了物质的原子观。
3. 尽管物质在本质上是原子的这一观点得到承认，但也产生了一个问题，即不同物质的原子是怎样相互区别的。卢克莱修认为具有苦味的物质的原子在其表面上有刮擦舌头的倒勾，而味道温和的物质的原子一定有一个平滑的表面。继卢克莱修之后，18世纪存在的物质的原子观没有太多的改进。柏拉图和亚里斯多德的哲学观点许多世纪以来一直统治着欧洲人的思想，他们两人都没有接受物质的原子观。尽管原子观偶有复活，但早期的物质微粒理论的倡导者主要是依靠直觉来支持他们的观点。然而在这一长时期里，实验工作如细小、间断的溪流缓缓流淌着。大多数实验工作受错误概念的促使，比如炼金术的观念认为像铅这类的普通金属可以转变为贵金属。然而化学物质怎样相互反应的经验得到积累，并且研究化学反应更定量的方法得到了发展，为新的更有意义的原子论的表述铺平了道路。在19世纪的早期，原子论出自于一个英国教师约翰道尔顿。在1803～1807年间发表的道尔顿的原子论与实验观察有密切的联系。他的努力非常成