化学专业英语

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科学出版社

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Chemistry Speciality English

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内 容 简 介

全书共四个部分，分别为化学物质命名法、阶梯式阅读训练、常用专业词汇和答案。第 1～4 章为命名部分，除给出化学元素、无机物、有机物和配合物命名规则外，还提供了一些侧重命名识别与运用的阅读材料。第 5～8 章为阅读部分，其中第 5 章属于初级专业阅读材料，可以用化学专业知识帮助专业词汇积累和阅读理解，适合初涉专业阅读的学生使用。第 6 章是基础专业阅读材料，选用较短篇的特殊科技文献，语言相对简单，但较专业化且书面化，以训练学生使用英文获取专业信息的能力。第 7、8 章选择文体语言结构相对规范的化学专业文献，训练学生用文体结构特点帮助理解主题信息的能力，重点放在把握全局和主要创新点上。常用专业词汇整理了适合基础阅读需要的词汇资料。答案部分给出了本书全部习题的相关答案。

本书可作为高等学校本(专)科化学专业英语教材，也可作为化学专业基础课的英文教材或供研究生翻译、写作训练使用。

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前　言

教育部颁布的《大学英语教学大纲》规定，学生在学完基础阶段的英语课程，并达到大学英语四级或六级后，都必须修读专业英语。本书是编者根据多年的教学实践编写而成的，以训练学生的专业阅读能力为核心目标，共分四个部分：化学物质命名法、阶梯式阅读训练、常用专业词汇和答案。

（1）化学物质命名部分除给出化学元素、无机物、有机物和配合物命名规则外，还精选了一系列侧重各类命名识别与运用的短篇阅读材料作为该部分的配合阅读练习，以备课堂短时阅读训练使用。

（2）阶梯式阅读训练分为基础阅读、进阶阅读和强化综合阅读三部分。

基础阅读部分选用描述基本(化学)常识信息，或讲授中学部分化学知识的阅读材料。这些阅读具有词汇量较小、背景知识要求不多、篇幅较短小的特点，适合初涉专业阅读的学生使用。在阅读技巧上，可以让已有(化学)信息帮助阅读理解，实现由普通英文阅读到化学专业英文阅读的过渡。在使用中要求能够理解全文并翻译部分句子。

进阶阅读部分选用语言简单、内容基础、篇幅较短但具备一般论文的主要结构的特殊专业文献文体。这类材料比基础阅读更专业化、书面化，适合学生在基础阅读之后，可以兼顾比较细节的专业词汇表达和放眼全局的通篇理解训练，实现从重视细节到把握主题的转化训练，实现阅读能力的进一步提高。在使用中要求能够理解全文主题，并练习部分翻译。

强化综合阅读部分选用结构完整清晰的专业研究型文献的全文进行实战练习。训练用文体结构特点帮助理解主体信息的能力，重点放在把握全局和主要创新点上。使用中要求能够关注局部细节，并配合进行较系统的翻译训练。

阶梯式阅读训练中每篇文章的画线句子是适合翻译训练的材料，供学生练习使用。

（3）常用专业词汇部分主要提供适合基础阅读需要的词汇资料。本书不仅整理及精选了网络和其他材料中总结的常用专业词汇，还分类汇编了不同类别的基础词汇以便学生使用和记忆，如化学元素、常用化学仪器、常见反应类型、常用化学缩写、常用化学前后缀等词汇表。

（4）答案部分给出了第5～8章全部练习题的相关答案。

全书由吉琳提出写作框架和编写原则，并做最后的统稿、定稿工作。吉琳编写了第1~4章部分内容，第7、8章和附录；林雨青、李雅萍共同编写了第1~4章部分内容和第5、6章。

本书在编写过程中得到了郭长彬、左霞、王勇等老师的大力支持与帮助，在此

表示衷心的感谢！感谢周逸、杨鑫、丁延会、樊峻赫、王克青、李博等同学在本书整理校对过程中的辛勤工作！

由于编者水平和时间有限，书中疏漏之处在所难免，恳请读者批评指正。

编　者

2015 年 11 月

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Part Ⅰ Nomenclature

化学物质命名法

Chapter 1

Chemical Element：化学元素

1.1.1 Text

1. Elements and compounds

A kind of matter consisting of atoms that all have nuclei with the same electric charge is called an element. For example, all of the atoms that contain nuclei with the charge +e, each nucleus having one electron attached to it to neutralize its charge, comprise the element hydrogen, and all of the atoms that contain nuclei with the charge +92e comprise the element uranium.

An element is a substance that is composed of atoms of one element only. An elementary substance is commonly called an element.

A compound is a substance that is composed of atoms of two or more different elements. These atoms of two or more different elements must be present in a definite numerical ratio, since compounds are defined as having a definite composition.

2. The names and symbols of the elements

The chemical symbols of the elements are used as abbreviations for their names. These symbols are usually the initial letters of the names, plus another letter when necessary. All but eleven of the elements are given a symbol corresponding to one or two letters in the English name of the element (the first letter is always capitalized and the second letter is never capitalized). One of these exceptions is tungsten, whose symbol (W) is derived from the German name of the element, Wolfram. The other ten have symbols derived from their Latin names. These are: stibium (Sb) for antimony, cuprum (Cu) for copper, aurum (Au) for gold, ferrum (Fe) for iron, plumbum (Pb) for lead, hydrargyrum (Hg) for mercury, kalium (K) for potassium, argentum (Ag) for silver, natrium (Na) for sodium, and stannum (Sn) for tin. The system of chemical symbols was proposed by the Swedish chemist Jöns Jakob Berzelius(1779—1848) in 1881. The elements are also shown in a special arrangement, the periodic table (Fig. 1.1).

Group / Period	1 Alkali metals	2 Alkaline earth metals	3	4	5	6	7	8	9	10	11	12	13	14	15 Pnictogens	16 Chalcogens	17 Halogens	18 Noble gases
1	Hydrogen 1 H																	Helium 2 He
2	Lithium 3 Li	Beryllium 4 Be											Boron 5 B	Carbon 6 C	Nitrogen 7 N	Oxygen 8 O	Fluorine 9 F	Neon 10 Ne
3	Sodium 11 Na	Magnesium 12 Mg											Aluminium 13 Al	Silicon 14 Si	Phosphorus 15 P	Sulfur 16 S	Chlorine 17 Cl	Argon 18 Ar
4	Potassium 19 K	Calcium 20 Ca	Scandium 21 Sc	Titanium 22 Ti	Vanadium 23 V	Chromium 24 Cr	Manganese 25 Mn	Iron 26 Fe	Cobalt 27 Co	Nickel 28 Ni	Copper 29 Cu	Zinc 30 Zn	Gallium 31 Ga	Germanium 32 Ge	Arsenic 33 As	Selenium 34 Se	Bromine 35 Br	Krypton 36 Kr
5	Rubidium 37 Rb	Strontium 38 Sr	Yttrium 39 Y	Zirconium 40 Zr	Niobium 41 Nb	Molybdenum 42 Mo	Technetium 43 Tc	Ruthenium 44 Ru	Rhodium 45 Rh	Palladium 46 Pd	Silver 47 Ag	Cadmium 48 Cd	Indium 49 In	Tin 50 Sn	Antimony 51 Sb	Tellurium 52 Te	Iodine 53 I	Xenon 54 Xe
6	Caesium 55 Cs	Barium 56 Ba	*	Hafnium 72 Hf	Tantalum 73 Ta	Tungsten 74 W	Rhenium 75 Re	Osmium 76 Os	Iridium 77 Ir	Platinum 78 Pt	Gold 79 Au	Mercury 80 Hg	Thallium 81 Tl	Lead 82 Pb	Bismuth 83 Bi	Polonium 84 Po	Astatine 85 At	Radon 86 Rn
7	Francium 87 Fr	Radium 88 Ra	*	Rutherfordium 104 Rf	Dubnium 105 Db	Seaborgium 106 Sg	Bohrium 107 Bh	Hassium 108 Hs	Meitnerium 109 Mt	Darmstadtium 110 Ds	Roentgenium 111 Rg	Copernicium 112 Cn	Ununtrium 113 Uut	Flerovium 114 Fl	Ununpentium 115 Uup	Livermorium 116 Lv	Ununseptium 117 Uus	Ununoctium 118 Uuo

*Lanthanides	Lanthanum 57 La	Cerium 58 Ce	Praseodymium 59 Pr	Neodymium 60 Nd	Promethium 61 Pm	Samarium 62 Sm	Europium 63 Eu	Gadolinium 64 Gd	Terbium 65 Tb	Dysprosium 66 Dy	Holmium 67 Ho	Erbium 68 Er	Thulium 69 Tm	Ytterbium 70 Yb	Lutetium 71 Lu
*Actinides	Actinium 89 Ac	Thorium 90 Th	Protactinium 91 Pa	Uranium 92 U	Neptunium 93 Np	Plutonium 94 Pu	Americium 95 Am	Curium 96 Cm	Berkelium 97 Bk	Californium 98 Cf	Einsteinium 99 Es	Fermium 100 Fm	Mendelevium 101 Md	Nobelium 102 No	Lawrencium 103 Lr

Primordial   From decay   Synthetic   Border shows natural occurrence of the element

Fig. 1.1 The periodic table

A symbol is used to represent an atom of an element, as well as the element itself. The symbol I represents the element iodine, and also may be used to mean the elementary substance. However I_2 is the customary formula for the elementary substance, because it is known that elementary iodine consists of molecules containing two atoms in the solid and liquid states as well as in the gaseous state (except at very high temperature). In formulas showing composition or molecular structure the numerical subscript of an element gives the number of atoms of the element in the molecule.

1.1.2 New words

element	n.元素	comprise	v.构成，组成
consist of	由……组成	composition	n.构成
atom	n.原子	abbreviation	n.缩写
nucleus	n.(原子)核	the periodic table	元素周期表
electron	n.电子	molecule	n.分子的

1.1.3 Company reading 1: Groups and subgroups in the periodic table of the elements

——A proposal of modification in the nomenclature

Since not all authors agree on specifying which are A and B subgroups in the periodic table of the elements, and since the letters A and B are arbitrary indications, either explanatory periphrases or misunderstandings are inevitable.

We propose to eliminate letters A and B, and propose to indicate the subgroups by letters referring directly to the electronic structure of atoms, that is by letters s, p, d and f according to the orbital block in which the subgroup is lying. For example, keeping in mind that the first group includes alkaline metals (which belong to s-block) and the transition metals copper, silver and gold (which belong to d-block), one can indicate alkaline metals as subgroup Ⅰ-s and the other three metals as subgroup Ⅰ-d. Similar considerations can be drawn for the other groups, so that the table can be complete as reported in the Fig. 1.2.

According to our proposal, scandium, yttrium and lanthanum, which are transition elements, belong to group Ⅲ-d (Fig. 1.2); boron, aluminum, gallium, indium and thallium belong to group Ⅲ-p; the lanthanide and actinide elements, in accordance with their structure, belong to group Ⅲ-f.

Hydrogen is known to have no fixed place in the periodic table. According to some

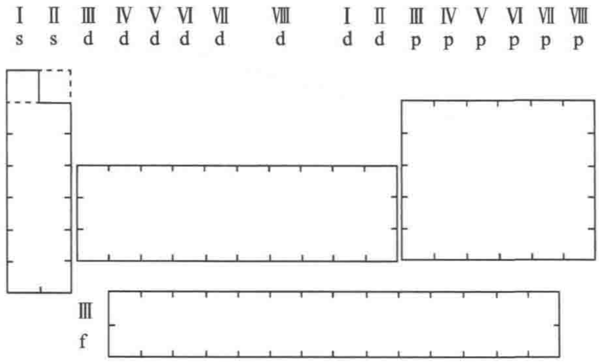

Fig. 1.2 Subgroups classification diagram

properties, hydrogen is included in the first group though it is not an alkaline metal; but based on other properties, it might be included among the halogens. That is why hydrogen is said to occupy a place apart in the periodic system. Similar considerations can be drawn for helium, which because of chemical properties is included among noble gases; but considering its electronic structure (J=1/2) it could be included in group Ⅱ, as a lighter homologous to beryllium. According to our proposed new system, one can simply say that hydrogen belongs to group Ⅰ-s. Helium either may be considered as an element of group Ⅱ-s or assigned a place apart as a Ⅷ-s element (the other noble gases form group Ⅷ-p).

This proposal has been adopted as an experiment in a chemistry course for students at the University of Milan, and it has met with student favor for didactic advantages and easy scientific correlations.

1.1.4 Company reading 2: C, H and N analysis of organic samples

The possibility mentioned above for the simultaneous determination of carbon dioxide and water allows the determination of the carbon and hydrogen content in an organic material by its complete combustion. In essence, the assembly of Fig. 1.3 is used with two absorption tubes, one for water and the other for carbon dioxide. The combustion tube contains a packing of oxidized copper wire, which is heated externally and assures the complete oxidation of evolved gases. Dry oxygen is frequently employed as the carrier gas to facilitate the combustion. To avoid the interference formed by other gaseous substances, the exit end of the combustion tube contains various fillings. For example, silver wool may be inserted to trap halogens and sulfur. Nitrogen in organic samples, after Dumas, is determined as follows. The sample is mixed with copper(Ⅱ) oxide and introduced into a tube that is already filled to about one half its length with this oxide. The tube is heated and combustion to water, carbon dioxide and nitrogen occurs. The combustion products are swept by carbon dioxide as the carrier gas into a special gas buret known as a nitrometer. This device is a graduated tube filled with concentrated potassium hydroxide solution. This solution absorbs all the carbon dioxide and water but not the nitrogen gas. The volume of nitrogen trapped above the solution is read and related to the amount of nitrogen in the sample.

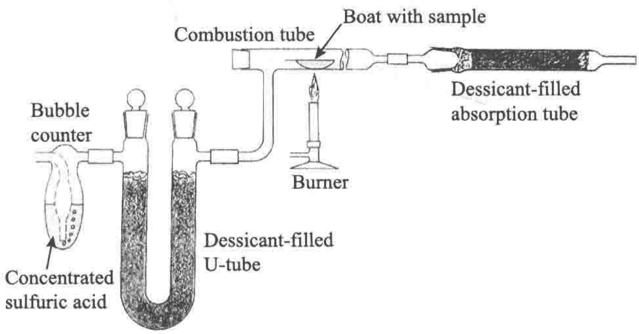

Fig. 1.3 Apparatus for the direct determination of water

Chapter 2

Nomenclature of Inorganic Compounds: 无机物的命名

2.1.1 Text

To find the information about a particular substance, you must know its chemical formula and name. The names and formulas of compounds are essential vocabulary in chemistry. The naming of substances is called chemical nomenclature from the Latin words "nomen" (name) and "calare" (to call).

There are now over 10 million known chemical substances. Naming them all would be a hopelessly complicated task if each had a special name independent of all others. Many important substances that have been known for a long time, such as water H_2O and ammonia NH_3, do have individual, traditional names. For most substances, however, we rely upon a systematic set of rules that lead to an informative and unique name for each substance, based on its composition.

The rules for chemical nomenclature are based on the division of substances into different categories. The major division is between organic compounds and inorganic ones. Organic compounds contain carbon, usually in combination with hydrogen, oxygen, nitrogen or sulfur. All other compounds are called inorganic compounds. Early chemists associated organic compounds with plants and animals, and they associated inorganic compounds with the nonliving portion of our world. Although this distinction between living and nonliving matter is no longer pertinent, the classification between organic and inorganic compounds continues to be useful. In this section, we consider the basic rules for naming inorganic compounds. Among inorganic compounds, we will consider three categories of substances: ionic compounds, molecular compounds and acids.

With the discovery of thousands of new inorganic compounds, it has become necessary to revise the traditional rules of nomenclature. An international committee has recommended a set of rules for naming compounds, and these are now being adopted throughout the world. Many of the older names are still used, however, and our ensuing discussion will include in many cases both the old and new, with emphasis on the latter. One of the principal changes is that proposed by Albert Stock and now known as the Stock System for the naming of compounds of metals (oxides, hydroxides and salts) in which the metal may exhibit more than one oxidation state. In these cases, the oxidation state of the metal is shown by a Roman numeral in parentheses immediately following the English name of the metal which corresponds to its oxidation number. If the metal has only one common oxidation number, no Roman numeral is used. Another important change is in the naming of complex ions and coordination compounds. We will defer the nomenclature of the latter until these compounds are discussed.

1. Naming ionic compounds: names for metal oxides, bases and salts

Recall that ionic compounds usually consist of chemical combinations of metals and nonmetals. The metals form the positive ions and the nonmetals form the negative ions. Let's examine the naming of positive ions, then the naming of negative ones. After that, we will consider how to put the names of the ions together to identify the complete ionic compounds.

1) Positive ions (cations)

(1) Cations formed from metal atoms have the same name as the metal:

Na^{+} sodium ion, Zn^{2+} zinc ion, Al^{3+} aluminum ion

Ions formed from a single atom are called monatomic ions.

(2) If a metal can form cations of differing charges, the positive charge is given by a Roman numeral in parentheses following the name of the metal:

Fe^{2+} iron(Ⅱ) ion, Fe^{3+} iron(Ⅲ) ion; Cu^{+} copper(Ⅰ) ion, Cu^{2+} copper(Ⅱ) ion

Ions with different charges exhibit different properties, such as color.

Most of the metals that have variable charge are transition metals, elements that occur in the block of elements from ⅢB to ⅡB in the periodic table. The charges of these ions are indicated by Roman numerals. The common metal ions that do not have variable charges are the ions of group ⅠA (Li^{+}, Na^{+}, K^{+}, and Cs^{+}), those of ⅡA (Mg^{2+}, Ca^{2+}, Sr^{2+}, and Ba^{2+}), as well as Al^{3+} (group ⅢA) and two transition-metal ions: Ag^{+} (group ⅠB) and Zn^{2+} (group ⅡB). Charges are not shown explicitly when naming these ions. If there is any doubt in your mind whether a metal forms more than one type of cation, indicate the charge using Roman numerals. It is never wrong to do so, even though it may be unnecessary.

An older method still widely used for distinguishing between two differently charged ions of a metal is to apply the ending -ous or -ic(Table 2.1). These endings represent the lower and higher charged ions, respectively. They are added to the root of the element's Latin name:

Fe^{2+} ferrous ion, Fe^{3+} ferric ion; Cu^{+} cuprous ion, Cu^{2+} cupric ion

Although we will not use these older names in this text, you might encounter them elsewhere.

(3) Cations formed from nonmetal atoms have names that end in -ium:

NH_4^+ ammonium ion H_3O^+ hydronium ion

These two ions are the only ions of this kind that we will encounter frequently in the text. They are both polyatomic (composed of many atoms). The vast majority of cations are monatomic metal ions. Table 2.1 are names of some metal oxides, bases and salts.

Table 2.1 Names of some metal oxides, bases and salts

Formula	Name	
FeO	Iron (Ⅱ) oxide	Ferrous oxide
Fe_2O_3	Iron (Ⅲ) oxide	Ferric oxide
$Sn(OH)_2$	Tin (Ⅱ) hydroxide	Stannous hydroxide
$Sn(OH)_4$	Tin (Ⅳ) hydroxide	Stannic hydroxide
Hg_2SO_4	Mercury (Ⅰ) sulphate	Mercurous sulphate
$HgSO_4$	Mercury (Ⅱ) sulphate	Mercuric sulphate
NaClO	Sodium hypochlorite	—
$K_2Cr_2O_7$	Potassium dichromate	—
$Cu_3(AsO_4)_2$	Copper (Ⅱ) arsenate	Cupric arsenate
$Cr(OAc)_3$	Chromium (Ⅲ) acetate	Chromic acetate

The names and formulas of some of the most common cations are shown in Table 2.2. The ions listed on the left are the monatomic ions that do not have variable charges. Those listed on the right are either polyatomic cations or cations with variable charges. The Hg_2^{2+} ion is unusual because this metal ion is not monatomic. It is called the mercury (Ⅰ) ion because it can be thought of as two Hg^{+} ions fused together.

Table 2.2 Common cations

Charge	Cations without variable charges		Polyatomic cations or cations with variable charges	
	Formula	Name	Formula	Name
1+	H^+	Hydrogen ion	NH_4^+	Ammonium ion
	Li^+	Lithium ion	Cu^+	Copper (Ⅰ) or cuprous ion
	Na^+	Sodium ion		
	K^+	Potassium ion		
	Cs^+	Cesium ion		
	Ag^+	Silver ion		
2+	Mg^{2+}	Magnesium ion	Co^{2+}	Cobalt (Ⅱ) or cobaltous ion
	Ca^{2+}	Calcium ion	Cu^{2+}	Copper (Ⅱ) or cupric ion