

北京大学专业英语丛书

化学专业基础英语

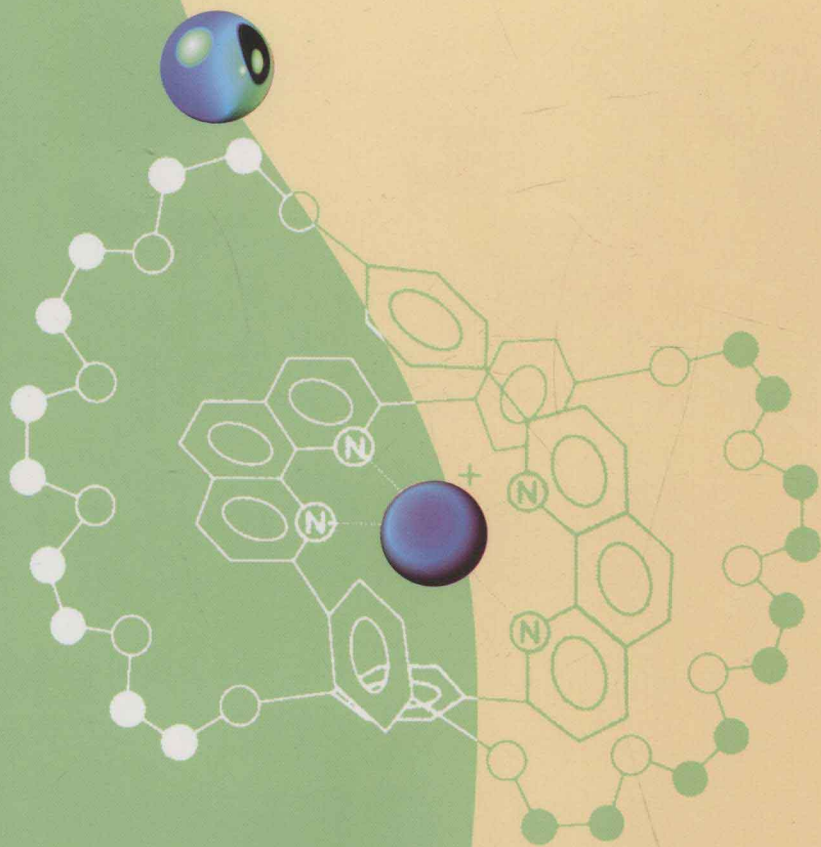
I

(第2版)

INTRODUCTORY
CHEMISTRY SPECIALITY
ENGLISH (2nd Edition)

魏高原 编

by Gaoyuan Wei



北京大学出版社
PEKING UNIVERSITY PRESS

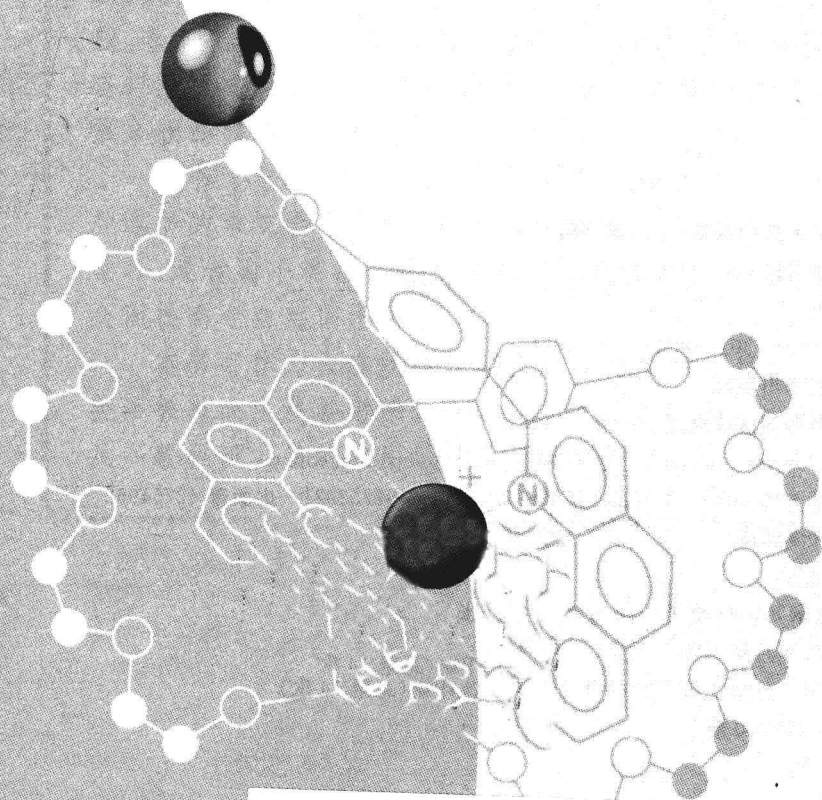
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内 容 简 介

本教材第2版根据北京大学化学学院试用多年的讲义及第1版教材修订而成,无论从内容取舍还是从教学目的上看都是有开创性的。本书在内容编排上试图训练学生在系统掌握专业英语词汇的基础上,学会用英语进行科学思维。经北大化学学院多年教学使用,受到学生普遍欢迎。全书50万字,分成基础化学讲座、重要专业术语和化学文献选讲及附录四部分。附录中为读者提供了习题答案和试题、基本化学术语总汇以及一些阅读、会话、写作和翻译用资料及提高听力用的化学录像、光盘及计算机课件目录。第2版的内容更加丰富。

本书可与《化学专业基础英语(Ⅱ)》配套使用——在接受本书的系统学习同时(或之后),如配合基础英语(Ⅱ)的学习,读者则不难在领略多彩的化学世界前沿领域的同时,全面提高专业英语水平。

本书可作为大专院校化学及相关专业高年级学生专业英语教材或主要参考书,也可作为理工类研究生和教师以及一般科研人员的实用科技英语参考读物。

序 (Preface)

《化学专业基础英语(I)》是根据教育部批准的《大学英语教学大纲》关于专业英语教学的要求和编者本人多年化学专业英语教学实践而编写的一部教材。该教材已在北京大学化学学院试用过七个学期,受到学生普遍欢迎。

该教材的目的是培养学习者在化学专业英语方面的较强的读、写、译的能力,并适当训练听、说的能力,不是单纯培养阅读能力。教材分三个部分:基础化学讲座、重要专业术语、化学文献选讲。附录部分包括总词汇表,习题答案,会话材料,翻译材料,常见化学计量单位、常数等的英文表达方式,常见科技英语语法结构等。

该教材的文章全部选自原文材料,有一定难度。文章内容虽然是有关化学,但不枯燥,文字优雅。教材覆盖化学专业所必需的基础知识及重要词汇和语法现象,并突出化学专业英语文献在文章结构、文字表达方面的特点。这一切都有利于学习者提高英语、迅速掌握化学专业英语。

该教材的练习形式新颖,突出实用,使学习者既能获得必要的化学知识以及解决问题的能力,又能发表个人独立的观点,在读、写、译方面得到训练,并且能通过对文章和议题的透彻理解和对观点的独立、精确的表达,培养科学精神。具体说来,编者希望通过使用本教材后,学习者能不借助字典读懂内容不十分专业的科技期刊如 *Nature* 和 *Science* 的文章,能写出一篇科技文章的摘要及小论文或能与同行进行有效的书信往来,能听懂一般化学方面的演讲或讲课,能与外国同行进行化学专业方面的口头交流,并能胜任专业知识方面的中英双向口译和笔译。

该教材设有考试样题。练习题和考试题大部分选自美国著名大学同类专业的教材,对学习者是一种挑战。练习题和考试题都附有答案。

该教材可作为大学化学专业英语教材,也可作为化学类基础课的英文教材。该教材可安排在三年级,用一个学期(18周,周学时2)教完。教学重点应是培养较强的化学专业英语的读、写、译的能力。参照教育部《大学英语教学大纲》关于专业英语教学各项指标要求,在使用该教材的过程中,教师可针对学习者的情况,采用灵活的教学方式,在有条件的院校,可用全英语授课,给学习者全面的化学英语训练。

该教材的后续教材《化学专业基础英语(II)》选用了美国普林斯顿大学出版社的原版书《设计分子世界——化学前沿》(作者 Philip Ball)。各章配有内容提要、词汇表、难句解释和翻译,使学习者进一步提高化学专业英语水平,并了解当今化学领域的新成果、新思想。

安美华
北京大学英语系
2001.3.25

编者的话(第2版)

(Words from the Editor for the 2nd Edition)

本教材自第1版于2001年4月出版以来,一直得到使用本书的大专院校专业英语教师及其他行业读者的厚爱。他们提出很多非常好的纠错与改进建议,包括河南省许昌学院“化学专业英语课件”课题组全体成员。后者还曾邀请本人去他们学院共商将本书做成多媒体教学课件事宜。当然,对本教材的改进提出最多也是最好的改进建议的当属本人所教的十多届北京大学化学学院本科生。特别是北京大学外国语学院英语系安美华教授给第1版所写的前言,对于本书的广泛传播起到了很大的促进作用。本书已经印刷了十多次,不能不促使本人于百忙中抽出时间尽快修订第1版。经过本人的修订及本书责任编辑赵学范编审的积极建议和认真审读,终于使本书第2版在篇章结构、体例和版式等诸方面均取得了令人满意的效果。

根据本人在北京大学使用本教材的教学经验,本打算在第2版里增加专业英语的写作与翻译方面的教学内容。但考虑到这样会显著增加本书的篇幅及售价,最终还是放弃了。好在过去十余年里已经出版了不少这方面的教材,例如田传茂主编的《大学科技英语》(湖北科学技术出版社,武汉,2007),魏汝尧与董益坤主编的《科技英语教程》及《科技英语教程学习指导》(北京大学出版社,北京,2005)及吴炯圻编著的《数学专业英语(第2版)》(普通高等教育“十一五”国家级规划教材,高等教育出版社,北京,2009)里就有关于科技英语的理解、翻译和写作的很好的阐述与许多应用实例,以及有关科技(例如数学)论文写作及英语文献查阅的介绍。需要这方面教学内容的教师可以考虑将之与第2版《化学专业基础英语(I)》一起使用。此外,本人在过去的课堂教学中还广泛使用了许多化学视频来训练学生专业英语听力,特别是美国进口原版化学电影节目《*The Super-charged World of Chemistry*(超酷化学世界)》(Standard Deviants Video Course Review, Debbie Mintz, et al., Cerebellum Corp., 1996)效果甚佳,很受学生欢迎。作为化学专业英语课外阅读补充读物,还可使用以下两本教材:刘宇红主编的《化学化工专业英语》(中国轻工业出版社,北京,2000)和由英国 Micheal Lewis 编写及荣国斌和饶腊霞注释的牛津专业英语基础丛书《*Advanced Chemistry through Diagrams*(化学专业英语基础——图示教程)》(上海外语教育出版社,上海,2000)。后者为牛津大学出版的英国 A-Level(相当于大学预科)考试复习用书,以图表形式归纳整理了化学学科的主要知识。

此次再版主要删减了第1版“附录 G 常用科技英语词汇(Word Study Material)”中的部分练习题以及“附录 I 基本化学术语总汇(Basic Chemical Terms)”的第一部分,增加了两章有关生物化学和高分子化学的基础讲座(第8章和第9章),以及“环境化学专业术语”(第16章)和“药物化学专业术语”(第17章)两章。在已有专业术语章节里,“有机化学专业术语”里增加了两节有关有机化合物基础知识方面的内容,“高分子化学专业术语”里增加了聚合物回收利用方面的内容,而“生物化学专业术语”里则增加了有关 DNA 与 RNA 等生物大分子在自然界起源方面的内容。在“化学文献选讲”部分增加了一篇发表在“*Nature*”(《自然》)杂志上的介绍神奇拉胀分子网络的分子力学模拟计算的研究论文。最后,重新编写了附录 A 中的表

A. 7 (Table A. 7 List of Audio-Video Material Teaching Basic Chemistry), 增加了化学方面的影像资料 and 多媒体课件等内容, 并对第 1 版附录 B~J 重新予以编排, 特别是在“基本化学术语总汇”里增加了索引页码。

最后, 非常感谢下列化学文献的作者和出版商的支持, 使得本教材的再版得以顺利完成。它们是:

(1) *An Introduction to Chemistry* (Mark Bishop, Pearson Education, Inc., San Francisco, CA, USA, 1st ed., 2002);

(2) 《环境化学——*Chemistry of the Environment*》(大学环境教育丛书, 【美】斯派罗, 斯蒂格利亚尼著, 影印本, 北京: 清华大学出版社, 第 2 版, 2003) 及其英文原著 *Chemistry of the Environment* (Thomas G. Spiro and William M. Stigliani, Pearson Education Asia Ltd., 2nd ed., 2003);

(3) 网页 http://en.wikipedia.org/wiki/medicinal_chemistry 和 <http://www.chem.qmul.ac.uk/iupac/medchem>;

(4) 《化学专业基础英语(II)(设计分子世界: 化学前沿)》(北京大学专业英语丛书, 【美】Philip Ball 著, 魏高原, 王剑波, 甘良兵 注释, 北京大学出版社, 2001) 及其英文原著 *Designing the Molecular World: Chemistry at the Frontier* (Philip Ball, Princeton University Press, Princeton, New Jersey, USA, 1994)。

魏高原

2011. 9. 28

于北京大学

编者的话(第1版)

(Words from the Editor for the 1st Edition)

现代通信和运输工具正使“地球村”这一设想日益变成现实,而同村的人必须能够进行有效的语言交流。尽管具有悠久历史的象形文字——中国汉字在计算机技术出现之前,一直难以为非华语使用者广泛应用,但相信在不久的将来,必定会有更多的地球村人能够使用这一令中华民族引以为豪的语言文字。不过,由于众所周知的原因,可以预见在未来二三十年内,英语仍将作为国际交往中使用最普遍的一种语言,特别对科学技术领域更是如此。更考虑到落实“科教兴国”战略的需要,并且教育部又于1999年6月颁布了新的《大学英语教学大纲》,新大纲明确规定:“学生在完成基础阶段的学习任务,达到英语四级或六级后,都必须修读专业英语,以便从学习阶段过渡到应用阶段”。新大纲还将专业英语定为必修课,要求教学学时数不少于100学时。此外,大纲对应用提高阶段中在词汇、读、听、说、写、译等方面提出了具体要求。本教材的编写正是在此大背景下应运而生,期望能在起到抛砖引玉作用的同时,缓解目前高校新型化学专业英语教材紧缺这一燃眉之急。

本教材是在1993年秋由编者完成的北京大学化学系“化学专业英语”课讲义《ENGLISH FOR CHEMISTRY STUDENTS——LECTURE NOTES》(胶印版)基础上整理、增补而成。新教材保留了原教材的风格,即突出对学生用英语进行科学思考的能力的训练。全书共16章,分成以下三大部分内容:基础化学讲座、重要专业术语和化学文献选讲。第一部分(第1~7章)内容的安排在国内抑或在全世界尚属首次,这主要是考虑到了编者本人在专业英语学习过程中所积累的一些经验。特别是每章后面所附普通化学习题练习(家庭作业)更系编者本人在国外攻读学位期间应用过的一种行之有效的学习专业英语的方法。同时,所教过的学生对此部分的内容普遍表示欢迎。第二部分(第8~13章)主要是为了扩大学生的专业词汇,以及训练学生准确理解专业术语精确定义的能力。第三部分(第14~16章)提供了若干有代表性的化学专业文献供选读,主要目的是让学生获得快速理解不同类型专业文献的技巧。最后,特别值得一提的是,本教材还在第四部分附录中为读者提供了较多的参考和补充资料,特别是在“基本化学术语总汇”中列出了本教材中出现的所有基础专业术语,相信会对读者在化学专业术语的掌握方面进行自我测试带来方便。此外,专业英语电化教学方面的参考资料在附录中有所提及,但限于篇幅,未能提供更多资料,希望将来能有这方面的专门教材问世。鉴于本教材属化学专业英语的入门教材,若能与同由北京大学出版社出版的《化学专业基础英语(II)——设计分子世界:化学前沿》(已列入《北京大学专业英语丛书》)联用,则效果会更好。

尽管本教材的主要内容已经在北京大学化学与分子工程学院讲授了7个学期,但由于属首次尝试,再加上时间仓促,错漏等不完善之处在所难免,敬请读者不吝指正。

本书能以今天的面貌出现,是与众多领导、师生和亲友的支持和帮助分不开的。编者特别感谢原化学系主管教学的副系主任常文保教授在过去几年里从各方面所给予的支持、鼓励和帮助,以及北京大学出版社领导和本书责任编辑赵学范老师在为使本书得以如期出版方面所

给予的大力支持和帮助。责编的高度敬业精神和高超编辑水平十分令人感动和钦佩。北京大学英语系安美华教授在使编者学会如何教好专业英语方面给予了很多宝贵的指点。化学学院的同行也给予编者很大帮助,这里要特别提到的有张榕森、甘良兵和王剑波,后者还试用过编者编写的胶印版讲义,并提出过宝贵的改进建议。还有编者所教过的数百名本科生的宝贵批评和鼓励意见,更是编者坚持将此教材完成的强大驱动力。最后,编者感谢夫人在过去几年里所给予的支持和谅解!

在本教材的编写过程中,编者引用了众多科技英语、期刊、教材、专著等英文原版参考文献中的有用部分。这些文献包括: *Chemistry* (2nd ed., John C. Bailar, Jr. et. al., Academic Press, Orlando, Florida, 1984——本教材的主要参考书)、*Fundamentals of Analytical Chemistry* (Douglas. A. Skoog and Donald M. West, Holt, Rinehart and Winston, Inc., 1963)、*Polymer Chemistry: The Basic Concepts* (Paul C. Hiemenz, Marcel Dekker, Inc., New York, 1984)、*Principles of Polymer Chemistry* (Paul J. Flory, Cornell University Press, Ithaca, New York, 1953)、*Biophysical Chemistry Part I: The Conformation of Biological Macromolecules* (Charles R. Cantor and Paul R. Schimmel, W. H. Freeman and Co., San Francisco, 1980)、*Scientifically Speaking: An Introduction to the English of Science and Technology* (B. C. Brookes, Bob Kesten, Viola Huggins, B. B. C. English by Radio and Television & The Chaucer Press, UK, 1971) 和 *A Course in Basic Scientific English* (J. R. Ewer and G. Latorre, Longman Group Ltd, London, 1969 & 1976)。在此,对作者和出版商们的支持表示衷心的感谢。

魏高原

1999. 6. 26

于燕园

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第一部分 (Part I)

**基础化学讲座
(Chemistry Lectures)**

第1章 化学的本质

Chapter 1 The Nature of Chemistry

The following is a letter to a friend from John C. Bailar, Jr., who has been a member of the chemistry department faculty at the University of Illinois for 56 years.

Dear Chris:

This letter is an answer to your questions about just what chemistry is and what chemists do. I'm glad that you asked, for many people have a distorted, or at least superficial, view of what the subject is all about. Whether I can give you a clear picture of it in a letter like this, I am not sure, but I shall try.

You know, of course, that chemistry is one of the physical sciences, along with physics, geology, and astronomy. Closely related, but in a somewhat different category, are the biological sciences, such as botany, physiology, ecology, and genetics. There is no sharp distinction between the two groups of sciences, or between those in either group, for they overlap each other. Often it is difficult to decide whether a specific topic belongs in one area or another. Many important subjects fall within the boundaries of several different disciplines. (Definitions of terms given in boldface type are listed at the end of this letter.)

All of the sciences overlap extensively with chemistry: they depend upon it and, in large measure, are based upon it. By that I mean that chemistry is really a part of all of the natural sciences, and a person cannot go very far in any science without some knowledge of chemistry. It would be possible to be a chemist without much knowledge of astronomy or physiology, but certainly, one could not make great progress in astronomy or physiology without some understanding of chemistry. A knowledge of chemistry is essential in other scientific fields as well. **Agriculturists, engineers and medical doctors use chemical concepts constantly.**

Chemistry is concerned with the composition of matter and the changes in composition which matter undergoes—in brief, chemistry is the science of matter. Physics is concerned chiefly with energy and with the interactions of matter and energy, including energy in such forms as heat, light, sound, electricity, mechanical energy, and nuclear energy. All changes in the composition of matter either release or absorb energy and for this reason the relationship between chemistry and physics is a most intimate one.

We think of any change in which the composition of matter changes as a chemical

change. For example, if you pour vinegar on baking soda in a glass vessel, you will see bubbles of gas escaping and the liquid will become warm as energy is released. When the bubbling stops, you can evaporate the liquid by boiling it, until finally only a white powder remains. But this white powder is not the original baking soda. It is a new substance with new characteristics. For example, it won't give off bubbles if you pour vinegar on it. This new material is different in composition from either of the materials which you originally mixed together. A chemical change has taken place.

By contrast, a physical change does not involve a change in the composition of matter. The melting of ice or the stretching of a rubber band are physical changes. It is often impossible to say whether a particular change is chemical or physical. Happily, it is not usually necessary to make a clear distinction between the two.

You must not assume that in your first course in chemistry you'll learn about the chemistry of the digestion of food or how a mixture of cement and water sets and hardens. These are complex processes, and before one can understand them one must first learn the chemistry of simpler substances. In learning to play the piano, a student does not start with Rachmaninoff's *Prelude in C # Minor*. A music student must first learn to play scales, and then simple pieces. It is only after months or years of practice that an individual can play the music of the masters. So it is with chemistry. You must first learn the fundamental principles and something about simple substances such as water and oxygen. A good understanding of the behavior of such substances will then allow you to understand the chemical behavior of more complex materials.

The science of chemistry is so broad that no one can be expert in all of its aspects. It is necessary to study the different branches of chemistry separately, and, if you become a chemist, to specialize in one or two branches of the subject.

Until about 150 years ago, it was believed that inanimate matter and living matter were of entirely different natures and had different origins. The inanimate matter was referred to as "inorganic" (meaning "without life") and the living matter and material derived from living matter were called "organic." However, in 1828, a German chemist named Friedrich Wöhler heated a material which was known to be inorganic and obtained a substance which all chemists recognized to be a product formed in life processes. So the distinction between "inorganic" and "organic" broke down. We still use these terms, but they now have different meanings from those they had in the early days. All living matter contains carbon chemically combined with hydrogen, so the chemistry of chemical compounds of carbon and hydrogen, whatever their origin, is called organic chemistry. Substances that do not contain carbon combined with hydrogen are "inorganic," and their chemistry is called inorganic chemistry. Carbon is very versatile in its behavior and is a key substance in a great many compounds, including most of the compounds essential to life.