

高等学校教材

环境科学与工程专业英语

第三版

华南理工大学 钟理 主编



化学工业出版社

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· 北 京 ·

全书共分为八个部分 (PART)。每个部分含若干个单元 (Unit), 共 42 个单元。每个单元由一篇课文和一篇阅读材料组成, 共计 84 篇。课文和阅读材料均选自原版英文教科书、科技报告、著作、专业期刊、国际会议论文集等。其中第一部分 1~4, 介绍环境科学与工程概述和历史; 第二部分 5~11, 介绍大气化学和空气污染及其防治; 第三部分 12~19, 介绍水污染来源种类、水化学、各种污水处理技术、处理单元设备等; 第四部分 20~23, 为固体废物及处理方法; 第五部分 24~27, 介绍其他污染及控制技术; 第六部分 28~35, 为环境管理, 包括介绍环境影响及其评价、环境监控和分析及采样程序、环境政策与策略; 第七部分 36~38, 生态系统与生态群落, 介绍环境生物与生态圈, 环境生态学, 生态与生命系统等; 第八部分 39~42, 作为拓展, 介绍绿色化学与技术, 清洁生产, 环境与可持续发展、清洁生产工艺及其绿色化学过程。每篇课文均配有与课文相对应的练习, 主要以主观练习题为主, 包括阅读与词汇练习, 英译汉与汉译英, 用英语回答问题及写出课文或某一段落的 summary 等。为便于学生自学, 本书每课配有单词和词组表, 并对课文的难点做必要的注释, 全书最后附有总词汇表。

本书是根据《大学英语教学大纲》(理工科本科用) 专业阅读部分的要求编写的, 是高等学校环境科学、环境工程或相关专业的教材, 也可供同等英语程度环境科学工作者及环境工程师或相关领域的科技人员使用。

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前 言

专业英语学习是高等院校理工科《英语教学大纲》所要求的内容，目的是使本科生在专业内容方面进行英语阅读的系统训练。对非英语专业的理工科学生而言，英语水平和英语使用的培养与提高不仅是综合素质的重要部分之一，而且也是能力的补充与文化素质提高延伸。在该阶段英语学习中，主要是提高学生正确、快速地阅读英语科技文献能力，初步学会专业英语写作与概括，掌握一定数量科技词汇及习惯用法，了解专业英语特点等，把学生学到的基础英语进行专业化训练，同时保持大学英语学习不断线。本教材是在《环境工程专业英语》（第一版）和（第二版）基础上，结合 21 世纪环境工程学科与其他学科的发展，根据目前高等院校环境类专业英语学习及要求，对原来教材进行了改编，增加了环境科学方面的内容。教材涉及环境科学与环境工程专业英语的词汇和常用的化学、化工等领域的科技词汇，词汇出现率较高。为了使学生从基础英语学习过程“单纯学习”转变到“使用”英语解决实际问题上来，教材的练习主要是以词汇、短语或句子的英译汉或汉译英，用英语回答问题或概括论文的主要观点，阅读文章后给出某一章节或段落或文章的摘要或小结（summary）等主观题型为主，而有别于基础英语学习采用客观选择题为主的练习，本书旨在为环境类专业的学生提供一本比较系统的专业英语教学用书，达到强化该专业学生用书面英语表达科技信息和使用英语的能力。

本书分为八个部分（PART）。每个部分含若干个单元（Unit），共 42 个单元。每个单元由一篇课文和一篇阅读材料组成。阅读材料提供与课文相应的背景知识或课文的续篇，以进一步拓宽课文的内容，根据课文内容，配有相应的练习题、注释和词汇表。课文和阅读材料均选自原版英文教科书、科技报告、著作、专业期刊、国际会议论文集等，题材较广，从纵横两个方面覆盖环境科学与工程专业的相关内容。其中

PART1 介绍环境科学与工程概述和历史，环境的研究，废物减量，城市环境，环境分析概括等；

PART2 介绍大气化学和空气污染及其防治，包括大气化学，环境大气化学，大气中的颗粒，大气中的氮化物及硫化物等的氧化过程，空气污染类型及来源，室内空气，空气污染的一般性治理技术和新技术等；

PART3 介绍水污染来源种类，水化学，各种污水处理技术，废水处理过程的单元设备及优化等；

PART4 为固体废物及处理方法，包括固体废物种类及来源，有害物质及处理方法，固体废物处理过程的能量与材料回收；

PART5 介绍其他污染及控制技术，包括噪声及噪声控制，全球变化，土壤污染，热污染及控制等；

PART6 为环境管理，包括介绍环境影响及评价，环境数据库统计分析的设计，空气质量环境评价，环境监控在污染科学中的作用，环境监控分析及采样程序，空气质

量监控，环境政策与策略；

PART7 为环境生态系统与生态群落，介绍环境生物与生态圈，环境生态学，生态与生命系统，可持续资源利用的工业生态学等；

PART8 为绿色化学与环境的可持续发展，包括绿色化学与技术，通过绿色化学与技术的可持续发展，清洁生产，替代溶剂，藻类产氢消除温室气体技术等。

书后附有总词汇表。为了便于学习，我们编写了配套的《双语学习 英汉环境科学与工程专业词典》。词典给出词或词组的中文和英文，同时对重要和常用的词或词组还给出它们英文的定义、含义及释义。

本教材在编写过程中得到化工类及相关专业大学专业英语阅读教材编审委员会、华南理工大学及化学工业出版社的大力支持。本教材对《环境工程专业英语》第一版和第二版作了较大修改补充。其中 PART1、PART3、PART7 和 PART8 由华南理工大学钟理编写，PART2 和 PART6 由浙江大学金一中、史惠祥及钟理编写，PART4 由郑州工业大学的刘宏、魏新利及钟理编写，PART5 由四川大学王跃川及钟理编写，全书最后由钟理统稿，华南理工大学的研究生张腾云、黄君涛和熊帆参加了文字编排、部分习题及注释，谨在此一并表示衷心感谢。

本教材涉及内容较广，虽经多次补充完善，限于编者水平，书中不足之处在所难免，希望读者不吝指正，使本书在使用过程中不断得到改进。

编 者

2011 年 8 月

第二版前言

专业英语练习是高等院校理工科《英语教学大纲》所要求的内容，目的是使本科生在专业内容方面进行英语阅读的系统训练。在这阶段英语学习中，主要是提高学生正确、快速地阅读英语科技文献的能力，初步学会专业英语的写作方法，掌握一定数量的科技词汇及其习惯用法，了解专业英语的特点等，把学生学到的基础英语进行专业化训练。本教材包括环境工程专业英语词汇和相当数量的常用科技词汇，词汇复现率较高。为使学生学习英语从“形式”用法提高到“实际”运用上来，练习主要以句子、段落或词汇的英译汉或汉译英，用英语回答问题及写出课文或某一段落的摘要等主观题型为主，而不是基础英语中的客观题（选择题）为主，从而强化学生用英语书面表达科技信息的能力。

教材第二版分为九个部分（PART），每个部分含若干个单元（Unit），共 37 个单元，每个单元由一篇课文和一篇阅读材料组成。阅读材料提供与课文相应的背景知识或是课文的续篇，以进一步拓宽课文内容。根据课文与阅读材料的内容，配有相应的练习题、注释和词汇表。课文与阅读材料均选自原版英文教科书、科技广告、著作、专业期刊及国际论文集等，体裁较广，从纵横两个方面覆盖环境工程专业的相关内容。其中：

PART 1 为环境工程概述，包括环境工程的历史，环境的研究，城市环境，废物减量，环境分析概况等；

PART 2 为空气污染及控制，包括空气污染类型及来源，空气污染对气候及生态的影响，空气污染的一般性治理技术和新的处理方法等；

PART 3 为水污染及废水处理，包括水污染来源及类型，废水处理的各種技术及方法，废水处理单元设备及优化等；

PART 4 为固体废物处理，包括固体废物种类及来源，有害物质及处理技术与方法，固体废物处理过程中的能量与材料回收等；

PART 5 为其他污染及控制技术，包括噪声，噪声控制，能耗与噪声，热污染及控制等；

PART 6 为环境影响评价，包括环境影响评价概况，废水对河水影响评价，空气质量环境评价等；

PART 7 为环境监控，包括山区、陆地覆盖环境的监控，环境数据库统计分析的设计，以及沉积物和土壤的采样程序介绍等；

PART 8 为环境政策与管理，包括当前新的环境政策和污染管理策略，还包括固体废物以及核污染废物的管理等；

PART 9 为环境与可持续发展，包括微生物清洁生产技术、绿色化学合成工艺技术以及藻类产氢消除温室气体技术等。

书后附有总词汇表。为了便于学习，我们编写了配套的《双语教学 英汉环境科学与工程专业词典》。该词典收集了本专业常用的词汇、词组，并且运用简明的英文对概

念进行解释。

本教材在编写过程中得到了化工类及相关专业大学英语专业阅读教材编审委员会、华南理工大学教务处、各编写单位以及化学工业出版社的大力支持。本教材第二版是在第一版基础上并结合当前形势发展，进行了较大的修改和补充。其中PART1、PART3、PART7、PART8和PART9由华南理工大学钟理编写，PART2和PART6由浙江大学金一中、史惠祥及华南理工大学钟理编写，PART4由郑州工业大学的刘宏和魏新利以及华南理工大学的钟理编写，PART5由四川联合大学王跃川及华南理工大学钟理编写，全书最后由钟理统稿，华南理工大学研究生张腾云、黄君涛和熊帆参加了文字编排、部分习题及注释，谨在此一并表示衷心感谢。

由于时间所限，本教材涉及内容较广，可能出现错漏，希望读者不吝指正，使本书在使用过程中不断得到改进。

编者

2005年2月

第一版前言

组织编审出版系列的专业英语教材，是许多院校多年来共同的愿望。在高等教育面向 21 世纪的改革中，学生基本素质和实际工作能力的培养受到了空前重视。对非英语专业的学生而言，英语水平和能力的培养不仅是文化素质的重要部分，在很大程度上也是能力的补充和延伸。在此背景下，教育部（原国家教委）几次组织会议研究加强外语教学问题，制订有关规范，使外语教学更加受到重视。教材是教学的基本要素之一，与基础英语相比，专业英语教学的教材问题此时显得尤为突出。

国家主管部门的重视与广大院校的呼吁引起了化学工业出版社的关注，他们及时地与原化工部教育主管部门和全国化工类专业教学指导委员会请示协商后，组织全国十余所院校成立了本套专业英语教材编委会。在经过必要的调查和研究后，根据学校需求，编委会优先从各校教学（交流）讲义中确定选题，同时组织力量开展编审工作。本套教材涉及的专业主要包括化学工程与工艺、石油化工、机械工程、信息工程、工业过程自动化、应用化学、生物工程、环境工程、精细化工及制药工程、材料科学与工程、化工商贸等。

根据“全国部分高校化工类及相关专业大学英语专业阅读教材编审委员会”的要求和安排编写的《环境工程专业英语》教材，可供环境工程及相关专业本科生使用，也可作为同等程度（通过大学英语四级）的专业技术人员自学教材。

内容与结构 教材分为七部分（PART），每个部分含 4~5 个单元（Unit），共 29 个单元，每个单元由一篇课文和一篇阅读材料组成（第七部分除外）。阅读材料提供与课文相应的背景知识或是课文的续篇，以进一步拓宽课文内容。根据课文与阅读材料的内容，配有相应的练习题、注释和词汇表。课文与阅读材料共计 54 篇，均选自原版英文教科书、科技报告、著作、专业期刊、产品说明书、专利及文摘等。体裁较广，从纵横两个方面覆盖环境工程专业的相关内容。其中：

PART 1 为环境工程概述，包括环境工程的历史，环境的研究，城市环境，能源开采与环境，环境分析概况等；

PART 2 为空气污染及控制，包括空气污染物类型及来源，空气污染对气候及生态的影响，空气污染治理的一般性技术和新的处理方法；

PART 3 为水污染及废水处理，包括水污染来源及类型，废水处理技术及方法，废水处理装置控制及优化；

PART 4 为固体废物及处理，包括固体废物种类及来源，有害物质及处理方法，固体废物及能量回收；

PART 5 为其他污染及控制技术，包括声音与噪声，噪声控制，能耗与噪声，热污染及控制；

PART 6 为环境影响评价，包括环境影响评价概况，废水对河水影响评价，空气质

量环境评价, 噪声影响评价等;

PART 7 为专利、广告、说明书, 包括专利文摘, 化学文摘, 销售广告, 招聘广告, CD-ROM 的使用说明。

书后附有总词汇表。

词汇与练习 专业英语练习是高等院校理工科《英语教学大纲》所要求的内容, 目的是使本科生在专业内容方面进行英语阅读的系统训练。在这阶段英语学习中, 主要是提高学生正确、快速地阅读英语科技文献的能力, 初步学会专业英语的写作方法, 掌握一定数量的科技词汇及其习惯用法, 了解专业英语的特点等, 把学生学到的基础英语进行专业化训练。本教材包括环境工程专业英语词汇和相当数量的常用科技词汇, 词汇复现率较高。习题设有词汇练习, 以利学生掌握基本词汇。为使学生学习英语从“形式”用法提高到“实际”运用上来, 练习主要以英译汉、汉译英、用英语回答问题及写出课文或某一段落的摘要等主观题型为主, 而不是基础英语中的客观题(选择题)为主, 从而强化学生用英语书面表达科技信息的能力。

致谢 本教材在编写过程中得到了化工类及相关专业大学英语专业阅读教材编审委员会、华南理工大学教务处、各编写单位以及化学工业出版社的大力支持。教材是四所院校的六位教师共同劳动的结晶。其中第一和第三部分由华南理工大学钟理编写, 第二和第六部分由浙江大学金一中和史惠祥编写, 第四和第七部分由郑州工业大学的刘宏和魏新利编写, 第五部分由四川联合大学王跃川编写, 全书最后由钟理统稿, 大连理工大学周集体审阅了全书, 并提出了许多宝贵意见, 清华大学环境科学与工程系张晓健教授提供了详尽的改进意见, 谨在此一并表示衷心感谢。由于时间所限, 对张晓健教授提出需作较大调整的内容暂未能改动, 在此向张教授致歉。本教材涉及内容较广, 可能出现错漏, 希望读者不吝指正, 使本书在使用过程中不断得到改进。

编者

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PART 1 INTRODUCTION TO ENVIRONMENTAL SCIENCE AND ENGINEERING

Unit 1

Text: What are Environmental Science and Engineering?

Natural Science

In the broadest sense, science is systematized knowledge derived from and tested by recognition and formulation of a problem, collection of data through observation, and experimentation. We differentiate between social science and natural science in that the former deals with the study of people and how they live together as families, tribes, communities, races, and nations, and the latter deals with the study of nature and the physical world. Natural science includes such diverse disciplines as biology, chemistry, geology, physics, and environmental science.

Environmental Science

Whereas the disciplines of biology, chemistry, and physics (and their subdisciplines of microbiology, organic chemistry, nuclear physics, etc.) are focused on a particular aspect of natural science, environmental science in its broadest sense encompasses all the fields of natural science. The historical focus of study for environmental scientists has been, of course, the natural environment. By this, we mean the atmosphere, the land, the water and their inhabitants as differentiated from the built environment. Modern environmental science has also found applications to the built environment or, perhaps more correctly, to the effusions from the built environment.

Quantitative Environmental Science

Science or, perhaps more correctly, the scientific method, deals with data, that is, with recorded observations. The data are, of course, a sample of the universe of possibilities. They may be representative or they may be skewed. Even if they are representative, they will contain some random variation that cannot be explained with current knowledge. Care and impartiality in gathering and recording data, as well as independent verification, are the cornerstones of science[Ⓢ].

When the collection and organization of data reveal certain regularities, it may be possi-

ble to formulate a generalization or hypothesis². This is merely a statement that under certain circumstances certain phenomena can generally be observed. Many generalizations are statistical in that they apply accurately to large assemblages but are no more than probabilities when applied to smaller sets or individuals.

In a scientific approach, the hypothesis is tested, revised, and tested again until it is proven acceptable.

If we can use certain assumptions or tie together a set of generalizations, we formulate a theory. For example, theories that have gained acceptance over a long time are known as laws. Some examples are the laws of motion, which describe the behavior of moving bodies, and the gas laws, which describe the behavior of gases. The development of a theory is an important accomplishment because it yields a tremendous consolidation of knowledge. Furthermore, a theory gives us a powerful new tool in the acquisition of knowledge for it shows us where to look for new generalizations. Thus, the accumulation of data becomes less of a magpie collection of facts and more of a systematized hunt for needed information. It is the existence of classification and generalization, and above all theory that makes science an organized body of knowledge.

Logic is a part of all theories. The two types of logic are qualitative and quantitative logic³. Qualitative logic is descriptive. For example we can qualitatively state that when the amount of wastewater entering a certain river is too high, the fish die. With qualitative logic we cannot identify what “too high” means—we need quantitative logic to do that.

When the data and generalizations are quantitative, we need mathematics to provide a theory that shows the quantitative relationships. For example, a quantitative statement about the river might state that “when the mass of organic matter entering a certain river equals x kilograms per day, the amount of oxygen in the stream is y . ”

Perhaps more importantly, quantitative logic enables us to explore “What if?” questions about relationships. For example, “if we reduce the amount of organic matter entering the stream, how much will the amount of oxygen in the stream increase?” Furthermore, theories, and in particular, mathematical theories, often enable us to bridge the gap between experimentally controlled observations and observations made in the field⁴. For example, if we control the amount of oxygen in a fish tank in the laboratory, we can determine the minimum amount required for the fish to be healthy. We can then use this number to determine the acceptable mass of organic matter placed in the stream.

Given that environmental science is an organized body of knowledge about environmental relationships, then quantitative environmental science is an organized collection of mathematical theories that may be used to describe and explore environmental relationships.

Engineering

Engineering is a profession that applies science and mathematics to make the properties of matter and sources of energy useful in structures, machines, products, systems, and processes.

Environmental Engineering

The Environmental Engineering Division of the American Society of Civil Engineers (ASCE) has published the following statement of purpose that may be used to show the relationship between environmental science and environmental engineering:

Environmental engineering is manifest by sound engineering thought and practice in the solution of problems of environmental sanitation, notably in the provision of safe, palatable, and ample public water supplies[®]; the proper disposal of or recycle of wastewater and solid wastes; the adequate drainage of urban and rural areas for proper sanitation; and the control of water, soil, and atmospheric pollution, and the social and environmental impact of these solutions. Furthermore it is concerned with engineering problems on the field of public health, such as control of arthropod-borne diseases, the elimination of industrial health hazards, and the provision of adequate sanitation in urban, rural, and recreational areas, and the effect of technological advances on the environment.

Neither environmental science nor environmental engineering should be confused with heating, ventilating, or air conditioning (HVAC), nor with landscape architecture. Neither should they be confused with the architectural and structural engineering functions associated with built environments, such as homes, offices, and other workplaces.

Selected from "Mackenzie L. Davis, Susan J. Masten. *Principles of Environmental Engineering and Science*, The McGraw-Hill Companies, Inc. USA 2004"

Words and Expressions

tribes [traibs] *n.* 部落, 群落

communities [kə'mju:nitis] *n.* 社区

subdisciplines [sʌb'disiplins] *n.* 分支学科

effusions [i'fju:ʒəns] *n.* 流出物, 出口流体

quantitative ['kwɒntiteitiv] *a.* 定量的

qualitative logic 定性逻辑学

quantitative logic 定量逻辑学

skewed [skju:d] *n./adj.* 偏离, 曲解

cornerstones ['kɔ:nəstəʊns] *n.* 基石

hypothesis [hai'pɒθisis] *n.* 假想, 假设

consolidation [kən.sɒli'deɪʃən] *n.* 加强, 协同, 合并, 凝固

magpie collection 胡乱收集, 混杂收集

logic ['lɒdʒik] *n.* 逻辑学

bridge the gap 填补差距

manifest ['mænɪfest] *v./a.* 表明, 显示

palatable ['pælətəbl] *a./ad.* 可口的, 受欢迎的

hazards ['hæzədʒ] *n.* 有害物

Notes

- ① Care and impartiality in gathering and recording data, as well as independent verification, are the cornerstones of science. 可译为：在数据收集与记录过程中仔细认真、无偏见和独立核实是科学的基石。
- ② When the collection and organization of data reveal certain regularities, it may be possible to formulate a generalization or hypothesis. 可译为：当对数据收集和整理披露了某些规律时，可能归纳出概况或假设。
- ③ The two types of logic are qualitative and quantitative logic. 可译为：两类逻辑学分别为定性与定量逻辑学。
- ④ Theories, and in particular, mathematical theories, often enable us to bridge the gap between experimentally controlled observations and observations made in the field. 可译为：理论，尤其是数学理论，通常使我们可以弥补（缩小）实验过程观察的结果与该领域理论推导的结果间的差距。
- ⑤ Environmental engineering is manifest by sound engineering thought and practice in the solution of problems of environmental sanitation, notably in the provision of safe, palatable, and ample public water supplies; 可译为：环境工程是在解决环境卫生问题过程中，具有代表性的，提供安全、可口与充足的公共供水过程，用正确的工程思想与合理的实施显现出来。

Exercises

1. Put the following words or phrases into Chinese.

Biology, races, disciplines, encompass, inhabitant, built environment, sound engineering, statistical, probability, organic matter, ample public water supply, disposal of wastewater

2. Put the following into English:

协同	胡乱收集	曲解	基石
流出物	假想	可口的	生物学

3. Translate the following passage into Chinese.

The environmental physical sciences have traditionally been concerned with individual environmental compartments. Thus, geology is centred primarily on the solid earth, meteorology on the atmosphere, oceanography upon the salt-water basins, and hydrology upon the behaviour of freshwaters. In general (but not exclusively) it has been the physical behaviour of these media which has been traditionally perceived as important. Accordingly, dynamic meteorology is concerned primarily with the physical processes responsible for atmospheric motion, and climatology with temporal and spatial patterns in physical properties of the atmosphere (temperature, rainfall, etc.). It is only more recently that chemical behaviour has been perceived as being important in many of these areas. Thus, while atmospheric chemical processes are at least as important as

physical processes in many environmental problems such as stratospheric ozone depletion, the lack of chemical knowledge has been extremely acute as atmospheric chemistry (beyond major component ratios) only became a matter of serious scientific study in the 1950s.

4. *What is the difference between social science and natural science based on the text? What is the difference between qualitative logic and quantitative logic according to the text?*
5. *Give a brief summary of Natural and Environmental Science.*
6. *What is the difference between Environmental Science and Environmental Engineering based on the text?*

Reading Material: Environmental Science

It may surprise the student of today to learn that “the environment” has not always been topical and indeed that environmental issues have become a matter of widespread public concern only over the past 20 years or so. Nonetheless, basic environmental science has existed as a facet of human scientific endeavour since the earliest days of scientific investigation. In the physical sciences, disciplines such as geology, geophysics, meteorology, oceanography, and hydrology, and in the life sciences, ecology, have a long and proud scientific tradition. These fundamental environmental sciences underpin our understanding of the natural world and its current-day counterpart perturbed by human activity, in which we all live.

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There are two major reasons why environmental chemistry has flourished as a discipline only rather recently. Firstly, it was not previously perceived as important. If environmental chemical composition is relatively invariant in time, as it was believed to be, there is little obvious relevance to continuing research. Once, however, it is perceived that composition is changing (e. g. CO₂ in the atmosphere; ¹³⁷Cs in the Irish Sea) and that such changes may have consequences for humankind, the relevance becomes obvious. The idea that using an aerosol spray in your home might damage the stratosphere, although obvious to us today,