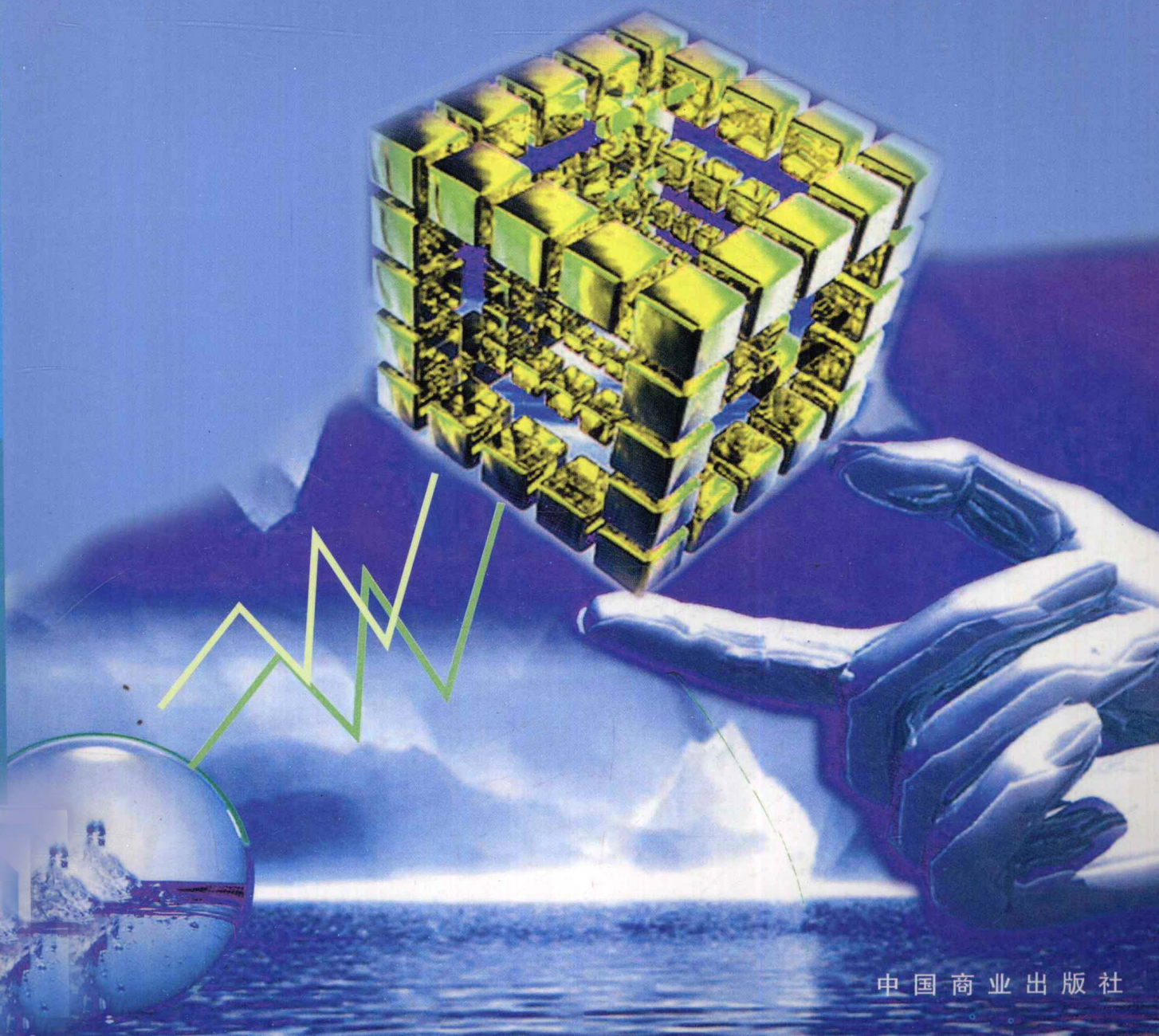
21世纪高职高专规化教材

制冷与空调专业英语

SPECIAL ENGLISH FOR REFRIGERATION& AIR CONDEITIONING

寿明道 编著



中国商业出版社

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编审说明

为适应21世纪我国高等职业技术教育的发展，培养高素质的管理人才和技术人才，根据制冷与空调专业教学计划和教学大纲的要求，结合我国制冷和空调行业的发展情况，我们组织全国有关职业技术学院的部分专业教师编写了《制冷与空调专业英语》一书。本书是高等职业技术教育必用教材，也可供职工大学、电视大学和高等专科学校使用，或作为本科院校的参考教材。

本教材由寿明道老师编著。在编写过程中，得到了美国特灵(Trane)公司滕毅博士，美国约克(York)国际(北亚)有限公司汪前彬硕士、戴益先生，美国开利(Carrier)空调(上海)有限公司、美国麦克维尔(McQuay)空调(上海)有限公司的大力支持与帮助；得到了上海商业职业技术学院副院长、教授、同济大学博士生导师冯伟国博士的指导和帮助。初稿完成后，承冯伟国教授在百忙之中审阅了全部书稿，在此一并表示诚挚的谢意。

由于编写时间仓促，编者水平有限，书中如有疏漏之处，敬请广大读者不吝赐教，以便于修订，使之日臻完善。

制冷与空调专业教材编审委员会

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前　言

本教材根据三年制制冷与空调专业教学计划及《制冷与空调专业英语》课程教学大纲编写，适用于二、三年制普通高职高专教育及五年一贯制高职和三、四年制中职制冷与空调专业学生使用，同时可供从事制冷与空调专业的各类公司培训使用，对本专业的工程技术人员也有较大的参考价值。

本教材共分 8 个单元，计 25 篇课文，60 篇阅读材料，所选课文及阅读材料几乎涵盖了本专业各专业课程的基本教学内容。

本教材的参考学时为 60 ~ 120 课时。

本教材以培养学生专业英语的阅读能力、熟悉和掌握本专业的专业词汇和专业术语为主要目标，同时加强基础知识，深化专业内容，扩大知识面，提高专业英语的阅读能力和翻译能力。

本教材在编写过程中，力求体现以下特色：

1. 反映现代制冷与空调专业中的最新成果。课文及阅读材料均选自近年来英美等国出版的文献资料以及本专业国际著名公司的技术培训资料。

2. 理论联系实际。本教材着重介绍设备与系统、操作、安装及维护中出现的专业俗语、术语、缩略语、简称和专业名称，以及上述专业用语的含义。本教材中选用了较多的设备外型和内部结构插图，力求图文并茂，一方面有利于学生学习过程中的理解、记忆，另一方面使学生建立原理与结构、操作与过程、外型与名称的联系，达到形式与内在、事物与名称的统一。

3. 针对中、高职两种层次、各地的实际情况、专业偏重以及不同专业方向，以及专业培训需要，本教材采用单元模块结构，便于各类学校及培训部门根据各自的情况灵活选用。各单元的标题中给出了本单元的主要教学内容和教学目标。课文与阅读材料的编写体例一致，均配有词汇、短语注释及课文注释，教学中可根据各自的需要将课文和阅读材料互换，灵活处理。阅读材料作为课文的扩展和延伸供学生课外阅读。

4. 本教材的编写过程中，编者已考虑到在全国逐渐开始的双语教学（Bilingual Education），注重本教材中专业内容的完整性，与中文专业教材的层次、主要教学内容及范围的一致，从这个意义上来说，本教材本身就是一本双语教学的专业教材。

5. 本教材注重英语语言教学、专业内容教学的两方面。在课文与阅读材料的选编过程中，编者对其中涉及的英语语法现象，以科技英语中常见、与学生英语基础相一致为取舍原则，对专业内容的取舍则以专业课程的教学大纲为参照点。专业英语课程的教学，一方面是英语语言教学向专业英语文献的阅读、理解与翻译等技能培养的转移，另一方面则是通过专业英语课程的学习，弥补在校生专业教学内容、认知面狭窄

的不足，使学生了解和掌握国外相关的专业理论与实践，了解英美国家文献资料中论述的本专业标准与现行规范、现行操作规则，使学生在毕业或培训后，可较快地应对实际工作中的问题。

由于编者水平有限，书中难免有疏漏和谬误之处，恳请读者批评指正。

编　者

2004 年 10 月

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Content

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Unit 1

Fundamentals of Refrigeration

By studying this unit, you will be able to:

1. Describe the early development of refrigeration and its main applications.
2. Discuss the basic physical, chemical, and engineering principles which apply to refrigeration.
3. Explain how cold preserves food.
4. Compare Fahrenheit, Celsius, Kelvin, and Rankine temperature scales.
5. Use temperature conversion formulas to convert from one temperature scale to another.
6. Discuss the differences between sensible heat and latent heat.
7. Describe the basic operation of a refrigerator.

Text 1

The Development of Refrigeration

Modern refrigeration has many applications. The first, and probably still the most important, [1]is the preservation of food, e. g. frozen foods and chilled foods.

Other important uses of refrigeration include air conditioning, beverage cooling, and humidity control. Many manufacturing processes also use refrigeration, e. g. gas separation.

Early refrigeration was obtained by use of ice. Ice from lakes and ponds was cut and stored in the winter in insulated storerooms for summer use. Most evidence indicates the Chinese were the first to store nature ice and snow to cool wine and other delicacies. Evidence has been found that ice cellars were used as early as 1000 B. C. in China. [2]

Ice was first made artificially about 1820 as an experiment. Not until 1834 did artificial ice manufacturing become practical. [3] Jacob Perkins invented the machine that led to our modern compression systems. Michael Faraday discovered the principles for the absorption type of refrigeration as early as 1824. It was not actually built until 1855 by a German engineer.

Mechanical domestic refrigeration first appeared about 1910. J. Larsen produced a manually operated household machine in 1913. By 1918 Kelvinator produced the first automatic refrigerator for the American market. Beginning with 1920, domestic refrigeration became an important industry. The Electrolux, which was an automatic domestic absorption unit, appeared in1927. [4]

By 1940, practically all domestic units were of the hermetic type. Commercial units had also been successfully made and used. These units were capable of refrigerating large commercial food storage systems. They could provide comfort cooling of large auditoriums. They could also produce low temperatures used in many commercial operations.

Starting in the 1960s, the home air conditioning market experienced tremendous growth. Energy was inexpensive, and therefore, simple air conditioning became common in many homes. Solar energy and other alternative energy sources became additional sources for powering heating and cooling systems.

Due to a tremendous growth in technology, by 1990 all areas of refrigeration and air conditioning were using microprocessor control systems. The purpose of these systems is to increase reliability and efficiency of the heating and cooling units. By 1990, the automobile air conditioner became as standard as the automatic transmission.

New Words and Expressions

1.	refrigeration	[riˌfridʒəˈreiʃən]	*n*.	冷藏，致冷，冷冻，冷却
2.	preservation	[ˌprezə(:)ˈveiʃən]	*n*.	保存

3.	frozen	['frəuzn]	*adj.*	冻结的，冷冻的，freeze 的过去分词
4.	chilled	[tʃild]	*adj.*	已冷的，冷硬了的，冷冻的，冷却的
5.	humidity	[hju:'miditi]	*n.*	湿气，潮湿，湿度
6.	insulated	['insjuleitid]	*adj.*	绝缘的，隔热的
7.	indicate	['indikeit]	*vt.*	指出，显示，象征，预示，简要地说明
8.	cellar	['sele]	*n.*	地窖，地下室，酒窖
9.	artificially	[ˌɑ:ti'fiʃəli]	*adv.*	人工地，人为地，人造地，不自然
10.	compression	[kəm'preʃ(ə)n]	*n.*	浓缩，压缩，压榨
11.	absorption	[əb'sɔ:pʃən]	*n.*	吸收
12.	refrigerator	[ri'fridʒreitə]	*n.*	电冰箱，冷冻器，冷冻设备，冷藏库
13.	hermetic	[hə:metik]	*adj.*	密封的，与外界隔绝的
14.	comfort	['kʌmfət]	*n.*	舒适
15.	auditorium	[ˌɔ:di'tɔ:riəm]	*n.*	会堂，礼堂
16.	tremendous	[tri'mendəs]	*adj.*	极大的，巨大的
17.	alternative	[ɔ:'tə:nətiv]	*adj.*	选择性的，二中择一的
18.	reliability	[riˌlaiə'biliti]	*n.*	可靠性

Phrases and Expressions

1. e. g. For example 例如
2. lead to... 导向…，导致…
3. capable of... 能够…的，可以…的
4. start in... 开始…，着手…
5. due to... 因为(由于)…，应归于

Technical Terms

1. ***Air conditioning:*** Control of the temperature, humidity, air movement, and cleaning of air in a confined space. 空气调节
2. ***Humidity***: Moisture, Dampness of air. 空气的湿度，空气的含湿量
3. ***Absorption:*** The process of taking or socking up into a substance. 吸收
4. ***Absorption unit:*** Refrigerator that creates low temperatures by using the cooling effect formed when a refrigerant is absorbed by chemical substance. 吸收式制冷机组
5. ***Hermetic type:*** 封闭式，密闭型(机组，压缩机)
6. ***Comfort cooler:*** System used to reduce the temperature in the living space in homes. These systems are not complete air conditioners as they do not provide complete control of heating, humidifying, dehumidification, and air circulation. 舒适型降温器，舒适型冷却器
7. ***Microprocessor:*** Electrical component consisting of integrated circuits that may accept information, store it, and control an output device. 微处理器

Notes to the text1.

[1] 可能仍是最重要的。
[2] 证据表明,中国早在公元前 1000 年即开始使用冰窖。
[3] 直至 1834 年,人造冰才进入实际生产。
[4] 首台自动化家用吸收式冰箱——伊莱克斯于 1927 年出现。

Reading material A

Cryogenics

The word *cryogenics* means, literally, the production of icy cold; however, the term is used today as a synonym for low temperatures. *Cryogenics* refers to creating and using temperatures in the range of 116 K down to 0 K (−157℃ down to −273℃). This is a logical dividing extremely line, because the normal boiling points of the so – called permanent gases, such as helium, hydrogen, neon, nitrogen, oxygen, and air, lie below −150℃.

Present – day applications of cryogenic technology are widely varied, both in scope and in magnitude. Some of the areas involving cryogenic engineering include:

1. *Rocket propulsion systems.* All the large launch vehicles use liquid oxygen as the oxidizer. The Space Shuttle propulsion system uses cryogenic fluids, liquid oxygen, and liquid hydrogen.

2. *Electronics.* Tiny superconducting electronic elements have been used as extremely sensitive digital magnetometers and voltmeters. Superconducting magnets have been used to levitate high – speed trains at speeds up to 500 km/h.

3. *Mechanical design.* Superconducting motors have been constructed with practically zero electrical losses for such applications as ship propulsion systems.

4. *Space simulation and high – vacuum technology.* To produce a vacuum that approaches that of out space, one of the more effective methods involves low temperatures. The cold of free space is simulated by cooling a shroud within the environmental chamber by means of liquid nitrogen.

5. *Biological and medical applications.* The use of cryogenics in biology, or cryobiology, has aroused much interest. Liquid – nitrogen – cooled containers are used to preserve whole blood, tissue, bone marrow, and animal semen for long periods of time. Cryogenic surgery (cryosurgery) has been used for the treatment of Parkinson's disease, eye surgery, and treatment of various lesions.

6. *Food processing.* Today frozen foods are prepared by placing cartons on a conveyor belt and moving the belt through a liquid – nitrogen bath or gaseous – nitrogen – cooled tunnel. Initial

contact with liquid nitrogen freezes all exposed surfaces and seals in flavor and aroma. [1]

7. *Manufacturing processes.* Oxygen is used to perform several important functions in the steel manufacturing process. About 50% of all the liquid oxygen produced is used in the steel industry to remove carbon from molten iron. Another 20% of the liquid oxygen is used in the chemical industry, to help make antifreeze and other commercial products.

New Words and Expressions

1.	cryogenics	[kraɪəuˈdʒenɪks]	*n.*	低温学
2.	permanent	[ˈpɜːmənt]	*adj.*	永久的，持久的
3.	helium	[ˈhiːljəm，-liəm]	*n.*	氦
4.	neon	[ˈniːən]	*n.*	氖
5.	nitrogen	[ˈnaitrədʒən]	*n.*	氮
6.	magnitude	[ˈmægnitjuːd]	*n.*	大小，数量，巨大，广大，量级
7.	propulsion	[prəˈpʌlʃən]	*n.*	推进，推进力
8.	oxidizer	[ˈɔksɪdaɪzə (r)]	*n.*	氧化剂
9.	superconducting	[ˌsjuːpəkənˈdʌktɪŋ]	*adj.*	超导的，无电阻率的
10.	sensitive	[ˈsensitiv]	*adj.*	敏感的，灵敏的，感光的
11.	levitate	[ˈleviteit]	*v.*	（使）轻轻浮起，（使）飘浮空中
12.	simulation	[ˌsimjuˈleiʃən]	*n.*	仿真，模拟，假装
13.	magnetometer	[mægniːtəuˈmiːtə]	*n.*	磁强计，地磁仪
14.	approach	[əˈprəutʃ]	*n.*	接近，逼近，方法，步骤，途径，通路
15.	shroud	[ʃraud]	*n.*	屏板，护罩，幕，管套，套筒，壳
16.	chamber	[ˈtʃeimbə]	*n.*	室，房间，舱，仓，枪膛
17.	cryobiology	[ˈkraiəubaiˈɔlədʒi]	*n.*	低温生物学
18.	lesion	[ˈliːʒən]	*n.*	损害，身体上的伤害
19.	aroma	[əˈrəumə]	*n.*	芳香，香气，香味
20.	antifreeze	[ˈæntiˈfriːz]	*n.*	防冻剂

Phrases and Expressions

1. refer to... 涉及，指的是，参考，适用于
2. so called... 所谓的
3. present – day 当前的，当代的
4. by means of... 用，以，依靠
5. used for... 被用来…
6. contact with... 和…接触，与…相关

Technical Terms

1. ***Boiling point:*** The temperature of a liquid at which it changes to a gas under a pressure of 14.7psia(101.3kPa). 沸点
2. ***Permanent gas:*** 永久气体,惰性气体
3. ***Liquid hydrogen:*** Nitrogen in liquid form used as a low – temperature refrigerant in expendable or chemical refrigerating systems. 液态氢气
4. ***Molten iron:*** 铁水

Notes to the text

[1] 今天,冷冻食品的加工方法是将(冷冻食品的)纸箱置于一台行走于液态氮的池槽或充氮冷却隧道的输送机胶带上,这样,所有最初与液态氮接触的外表面即被冻结,各种香味得以封闭。

Reading material B

Frozen Foods

Frozen foods have an excellent safety record and freezing has never been reported to be the cause of food poisoning. The great advantage of freezing is that micro – organisms do not grow in foods when the temperature is – 10℃ or colder. However, it should not be overlooked that although freezing kills some microorganisms, it does not eliminate pathogenic microorganisms nor microbial toxins present in the food product prior to freezing. [1]

Inactivation of micro – organisms caused by freezing and thawing may take place in three ways:

1. When a food is cooled so that vegetative micro – organisms are kept at temperatures below their minimum for growth, some loss of viability can be expected.

2. Inactivation of microorganisms take place during the freezing process.

3. Finally, inactivation of microorganisms may take place during storage, depending on storage time and temperature.

During the freezing process the product temperature is lowered and most water in the food is transformed into ice crystals. With decreasing temperature the liquid phase becomes more and more concentrated. As the volume of ice is about 10% larger than the volume of water, the internal pressure in the food may rise to 10 bar or more, especially during very rapid freezing. This pressure is sufficiently high to cause undesirable textural changes in some foods, but not

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