田孟超 郑瑾 杨凯 编著

轻化工程专业英语

Specific English for Light Chemical Engineering

東華大學出版社

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内容提要

本书将纤维、纺织、印染、服装的专业内容进行了整合，从一个较广阔的范围全面向学生提供了专业背景及其概论知识。本书内容广泛、学科脉络清晰，从纤维到纺织，从印染到服装，内容共分为9章。第1、2章分别介绍纺织材料与纺织技术；第3章为织物的前处理；第4～7章分别介绍颜色理论、染料化学、染色技术、印花技术；第8章介绍后整理；第9章介绍服装工程的基本内容。

本书可作为化纤、纺织、印染、服装材料、纺织检验等本(专)科的专业英语教材或专业导论教材，也可供相关专业师生和工程技术人员参考。

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前　言

轻化工程(染整方向)专业英语是我国高等院校轻化工程(染整方向)专业本科生在学习专业课程的同时开设的一门专业必修课,旨在通过该课程的学习,使学生熟悉轻化工程专业领域常见的英文词汇,掌握该专业英语的特点及其翻译技巧,了解科技论文的阅读及写作方法,以便能够准确迅速地获取染整及相关行业的发展信息,提高学习、工作和对外交往的能力。

系统全面、准确实用是本教材的特色。本教材的参编人员为在高校从事专业英语教学的老师,有较高的学历背景和丰富的教学经验,课文取材广泛,内容新颖,词汇量适中,知识覆盖全面。

笔者建议轻化工程(染整方向)专业英语课程安排在大三至大四上学期,让本科生学习专业知识的同时,掌握一定的英文专业知识,为方便阅读、检索英文资料和以后的深造与将来参加工作打下基础。

本书编写的出发点是以轻化工程(染整方向)专业的学生学习为主,兼顾相关类专业学生的学习。

我们以专业内容介绍为主线索,同时为学生日后所要开设的课程、知识体系勾勒出一个轮廓。我们把轻化工程专业的专业基础课和专业课的内容精选为 9 个单元,每一单元对应一门课程,同时也是对应一个模块的知识。第 1、2 章分别介绍纺织材料与纺织技术;第 3 章为织物的前处理;第 4～7 章分别介绍颜色理论、染料化学、染色技术、印花技术;第 8 章介绍后整理;第 9 章介绍服装设计与工程的基本内容。

内容的选编与取舍,侧重对基本框架的搭建和基础概念的陈述,了解学科中最基础同时也是最重要的学科思想。

第 1 章为纤维部分,介绍主要的纺织材料即天然纤维与化学纤维,天然纤维介绍棉、麻、毛、丝的基本结构特点与性能,化学纤维介绍再生纤维素纤维与合成纤维,介绍了基本的纺丝方法如熔融纺丝、干法纺丝、湿法纺丝等。

第 2 章为纺织技术部分,介绍了纺纱、机织、针织、非织造布的概念与基本原理。

第 3 章为前处理部分,介绍了织物的前处理如退浆、煮练、漂白、烧毛、丝光等。

第 4 章为颜色光学部分,介绍了物质显现颜色的原理以及视觉的构成,三原色以及二次色、三次色等配色理论。

第 5 章为染料化学部分,介绍了基本的染料种类及其性能特点,染料颜色与结构之间的关系。

第 6 章介绍染色工艺与染色设备,包括上染的过程与固色,包括纱线染色、纤维染色、匹布和成衣的染色,以及相应的染色设备,如染缸、轧染机、卷染机、绳状染色机、溢流染色机、气流染色机等。

第 7 章介绍印花工艺与印花设备,包括基本的印花、干燥、蒸化、洗涤,印花包括木版印花发展到现在的辊筒印花,钢网印花发展到现在的丝网印花(平网、圆网),数码印花以及涂料印花技术。

第 8 章介绍后整理，包括机械整理的轧光、定型、预缩等，化学整理的抗静电、抗起球、阻燃、抗菌、拒水整理等。

第 9 章介绍服装工程方面的内容，包括款型、面料、制板、缝制、成型、熨烫、推广等。

互联网的发展使人们可以足不出户获取广阔的知识与资源，开放性的知识交互平台可以普遍地提高人类的素质与知识水平。本书的部分内容选编自维基百科(Wiki Encyclopedia)在“知识共享　署名—相同方式共享　2.5 协议”之条款下提供，也在每章的参考文献中都列有出处，在此向不知名的信息提供者表示感谢。“知识共享　署名—相同方式共享 2.5协议”之条款参见 http://creative commons. org/licenses/by-sa/2.5/cn/legalcode。

本书第 3 章、第 8 章内容及图片部分来自 Charles Tomasino 所著 Chemistry & Technology of Fabric Preparation & Finishing，第 5 章、第 6 章、第 7 章内容及图片部分来自 Arthur D Broadbent 所著 Basic Principles of Textile Coloration，在此一并表示感谢。

全书由田孟超教授主持编写并统稿，并编写第 1～3 章；副主编郑瑾博士编写第 4～6 章；杨凯博士编写第 7～9 章。

何建新博士审阅了教材的第 2 章，在此表示感谢。

由于编著者水平所限，书中难免有错误和不妥之处，恳请读者不吝指正，以便今后不断努力改进！

编著者

2009 年 10 月

课程设置指导

课程名称:轻化工程专业英语

适用专业:轻化工程(染整方向)、纺织工程、高分子材料(化纤方向)、服装设计与工程

总学时:30 学时～45 学时

课程性质:本课程为轻化工程(染整方向)专业英语课程,可以作为纺织、高分子材料、服装类专业的专业英语入门导论课程。

建议开设时间:大三学年或大四学年上学期

课程目的:

1. 为轻化工程(染整方向)专业学生学习专业英语提供教材。

2. 为纺织工程、高分子材料(化纤方向)、服装设计与工程专业学生学习专业英语提供帮助。

3. 为轻化工程(染整方向)、纺织工程、高分子材料(化纤方向)、服装设计与工程专业学生掌握染整专业英语词汇,自主学习外文教材及获取外文信息资料打下基础。

课程教学基本要求:

教学环节以课堂教学为主。

因篇幅所限,本书未安排实验或实习环节,但任课教师若能随课堂教学的进展辅以实验室参观、工厂认知实习,则效果更佳。譬如:第 1 章时可安排一次化纤厂的参观,了解化学纤维的生产制造过程,第 2 章时可安排纺织厂的参观,第 3～8 章可安排印染厂参观,第 9 章可安排服装厂的参观。如因条件所限,不能安排如此多的实习参观内容,可以校内的实验室参观为主,辅以工厂的图片或录像。

参考文献部分给出了文中资料来源,教师可引导学生自主查询资料的出处,并得到知识来源或其原貌,进而思考编者取舍的原则。

每一章内容后提供的"延伸阅读",均为与本章内容密切相关的经典教材及相关专著,大部分将为其在高年级学习专业课程时所用,可以让学有余力又感兴趣的同学自主查找资料学习。

教学学时分配:

可以每单元 3～5 学时平均分配,亦可由教师灵活调整;实习或参观环节自行安排。

Contents 目录

Unit 1 Fibers 纤维

1.1 Overview 概述

Fiber is a class of materials that are continuous filaments or are in discrete elongated pieces, similar to lengths of thread. They are very important in the biology of both plants and animals, for holding tissues together. Human uses of fibers are diverse. They can be spun into filaments, string or rope, used as a component of composite materials, or matted into sheets to make products such as paper or felt. Fibers are often used in the manufacture of other materials. Synthetic fibers can be produced very cheaply and in large amounts compared to natural fibers, but natural fibers enjoy some benefits, such as comfort, over their man-made counterparts.

细丝
线
纺
毡

1.1.1 Natural Fibers 天然纤维

Natural fibers include those produced by plants, animals, and geological processes. They are biodegradable over time. They can be classified according to their origin:

地质/可生物降解

Vegetable fibers are generally based on arrangements of cellulose, often with lignin: examples include cotton, hemp, jute, flax, ramie, and sisal. Plant fibers are employed in the manufacture of paper and textile (cloth), and dietary fiber is an important component of human nutrition.

草本植物纤维
木质素/大麻
黄麻/亚麻/苎麻/剑麻
膳食纤维

Wood fiber, distinguished from vegetable fiber, is from tree sources. Forms include groundwood, thermomechanical pulp (TMP) and bleached or unbleached kraft or sulfite pulps. Kraft and sulfite, also called sulphite, refer to the type of pulping process used to remove the lignin bonding the original wood structure, thus freeing the fibers for use in paper and engineered wood products such as fiberboard.

木本植物纤维
磨木浆/热磨机械浆
卡夫浆/亚硫酸盐浆

Animal fibers consist largely of particular proteins. Instances are spider silk, sinew, catgut, wool and hair such as cashmere, mohair and angora, fur such as sheepskin, rabbit, mink, fox, beaver, etc.

蜘蛛丝/肌腱/羊肠线/开士米羊毛/马海毛/安哥拉羊毛/貂皮/海狸皮毛

Mineral fibers comprise asbestos. Asbestos is the only naturally occurring long mineral fiber. Short, fiber-like minerals include wollastonite, attapulgite and halloysite.

石棉

硅矿石/凹凸棒/多水高岭土

1.1.2 Chemical Fibers 化学纤维

There are two sorts of chemical fibers: synthetic fibers and regenerated fibers. Synthetic fibers generally come from synthetic materials such as petrochemicals. Regenerated fibers are manufactured from natural cellulose, including rayon, modal, and the more recently developed Lyocell. Cellulose-based fibers are of two types, regenerated or pure cellulose such as from the cupro-ammonium process and cellulose derivatives such as the cellulose acetates.

粘胶纤维/莫代尔纤维
莱赛尔纤维
铜氨
纤维素醋酸酯

1.1.2.1 Inorganic Fibers 矿物纤维

Fiberglass, made from specific glass, and optical fiber, made from purified natural quartz, are also man-made fibers that come from natural raw materials. Metallic fibers can be drawn from ductile metals such as copper, gold or silver and extruded or deposited from more brittle ones, such as nickel, aluminum or iron. Carbon fibers are often based on carbonised polymers, but the end product is pure carbon.

1.1.2.2 Synthetic Fibers 合成纤维

Synthetic fibers are a subset of man-made fibers, which are based on synthetic chemicals (often from petrochemical sources) rather than arising from natural materials by a purely physical process. Such fibers are made from: polyamide nylon, PET or PBT polyester, phenol-formaldehyde (PF), polyvinyl alcohol fiber (PVA), polyvinyl chloride fiber (PVC), polyolefins (PP and PE), acrylic polymers, pure polyacrylonitrile. PAN fibers are used to make carbon fiber by roasted them in a low oxygen environment. Traditional acrylic fiber is used more often as a synthetic replacement for wool. Carbon fibers and PF fibers are noted as two resin-based fibers that are not thermoplastic, most others can be melted.

Aromatic polyamids (aramids) such as Twaron, Kevlar and Nomex thermally degrade at high temperatures and do not melt. These fibers have strong bonding between polymer chains polyethylene (PE), eventually with extremely long chains / HMPE (e. g. Dyneema or Spectra). Elastomers can even be used, e. g. spandex although urethane fibers are starting to

芳香族聚酰胺

replace spandex technology.

Coextruded fibers have two distinct polymers forming the fiber, usually as a core-sheath or side-by-side. Coated fibers exist such as nickel-coated to provide static elimination, silver-coated to provide anti-bacterial properties and aluminum-coated to provide RF deflection for radar chaff. Radar chaff is actually a spool of continuous glass tow that has been aluminum coated. An aircraft-mounted high speed cutter chops it up as it spews from a moving aircraft to confuse radar signals.

皮芯结构/并列结构

1.1.2.3 Microfibers 超细纤维

Microfibers in textiles refer to sub-denier fibers (such as polyester drawn to 0.5 Denier). Denier and dtex are two measurements of fiber yield based on weight and length. If the fiber density is known you also have a fiber diameter, otherwise it is simpler to measure diameters in micrometers. Microfibers in technical fibers refer to ultra fine fibers (glass or meltblown thermoplastics) are often used in filtration. Newer fiber designs include extruding fiber that splits into multiple finer fibers.

旦尼尔/分特

超细纤维

Most synthetic fibers are round in cross-section, but special designs can be hollow, oval, star-shaped or trilobal. The latter design provides more optically reflective properties. Synthetic textile fibers are often crimped to provide bulk in a woven, non woven or knitted structure. Fiber surfaces can also be dull or bright. Dull surfaces reflect more light while bright tends to transmit light and make the fiber more transparent.

中空/椭圆/三叶形

机织布/非织造布
针织布

Very short and/or irregular fibers have been called fibrils. Natural cellulose, such as cotton or bleached kraft show smaller fibrils jutting out and away from the main fiber structure.

原纤

1.2 Natural Fibers 天然纤维

1.2.1 Cotton 棉

Cotton is a soft, staple fiber that grows in a form known as a boll around the seeds of the cotton plant, a shrub native to tropical and subtropical regions around the world, including Americas, India and Africa. The fiber most often is spun into yarn or thread and used to make a soft, breathable textile, which is the most widely used natural-fiber cloth in clothing today.

短纤维
圆荚/灌木
热带/亚热带

纱

1.2.1.1 Cultivation 种植

Successful cultivation of cotton requires a long frost-free period, plenty of sunshine, and a moderate rainfall, usually from 600 to 1200mm (24 to 48 inches). Soils usually need to be fairly heavy, although the level of nutrients does not need to be exceptional. In general, these conditions are met within the seasonally dry tropics and subtropics in the Northern and Southern hemispheres, but a large proportion of the cotton grown today is cultivated in areas with less rainfall that obtain the water from irrigation. Production of the crop for a given year usually starts soon after harvesting the preceding autumn. Planting time in spring in the Northern hemisphere varies from the beginning of February to the beginning of June. The area of the United States known as the South Plains is the largest contiguous cotton-growing region in the world. It is heavily dependent on irrigation water drawn from the Ogallala Aquifer.

无霜期

Cotton is a thirsty crop, and as water resources get tighter around the world, economies that rely on it face difficulties and conflict, as well as potential environmental problems. For example, cotton has led to desertification in areas of Uzbekistan, where it is a major export. In the days of the Soviet Union, the Aral Sea was tapped for agricultural irrigation, largely of cotton, and now salination is widespread.

1.2.1.2 Competition From Synthetic Fibers 与合成纤维的竞争

The era of manufactured fibers began with the development of Rayon in France in the 1890s. Rayon is derived from a natural cellulose and cannot be considered synthetic, but requires extensive processing in a manufacturing process and led the less expensive replacement of more naturally derived materials. A succession of new synthetic fibers were introduced by the chemicals industry in the following decades. Acetate in fiber form was developed in 1924. Nylon, the first fiber synthesized entirely from petrochemicals, was introduced as a sewing thread by DuPont in 1936, followed by Dupont's acrylic in 1944. Some garments were created from fabrics based on these fibers, such as women's hosiery from nylon, but it was not until the introduction of polyester into the fiber marketplace in the early 1950s that the market for cotton came under threat. The rapid uptake of polyester garments in the 1960s caused economic

袜类

hardship in cotton exporting economies, especially in Central American countries such as Nicaragua where cotton production had boomed tenfold between 1950 and 1965 with the advent of cheap chemical pesticides. Cotton production recovered in the 1970s, but crashed to pre-1960 levels in the early 1990s.

Beginning as a self-help program in the mid-1960s, the Cotton Research & Promotion Program was organized by the U. S. cotton producers in response to cotton's steady decline in market share. At that time, producers voted to set up a per-bale assessment system to fund the program, with built-in safeguards to protect their investments. With the passage of the Cotton Research & Promotion Act of 1966, the program joined forces and began battling synthetic competitors and re-establishing markets for cotton. Today, the success of this program has made cotton the best-selling fiber in the U. S. and one of the best-selling fibers in the world.

Administered by the Cotton Board and conducted by Cotton Incorporated, the Cotton Research & Promotion Program works to greatly increase the demand for and profitability of cotton through various research and promotion activities. It is funded by the U. S. cotton producers and importers.

1.2.1.3 Uses 用途

Cotton is used to make a number of textile products. These include terrycloth, used to make highly absorbent bath towels and robes; denim, used to make blue jeans; chambray, popularly used in the manufacture of blue work shirts (from which we get the term "blue-collar"); and corduroy, seersucker, and cotton twill. Socks, underwear, and most T-shirts are made from cotton. Bed sheets often are made from cotton. Cotton also is used to make yarn used in crochet and knitting. Fabric also can be made from recycled or recovered cotton that otherwise would be thrown away during the spinning, weaving, or cutting process. While many fabrics are completely made of cotton, some materials blend cotton with other fibers, including rayon and synthetic fibers such as polyester. It can either be used in knitted or woven fabrics, as it can be blended with elastine to make a stretchier thread for knitted fabrics, and things such as stretch jeans.

毛圈织物
牛仔布/蓝斜纹布工装裤
灯芯绒/泡泡纱/全棉纱卡
弹性纤维

In addition to the textile industry, cotton is in fishnets, coffee filters, tents, gunpowder, cotton paper, and bookbinding. The

first Chinese paper was made of cotton fiber. Fire hoses were once made of cotton.

Cotton linters are fine, silky fibers which adhere to the seeds of the cotton plant after ginning. These curly fibers typically are less than 1/8 in (3 mm) long. The term also may apply to the longer textile fiber staple lint as well as the shorter fuzzy fibers from some upland species. Linters are traditionally used in the manufacture of paper and as a raw material in the manufacture of cellulose.

棉短绒 轧棉

Shiny cotton is a processed version of the fiber that can be made into cloth resembling satin for shirts and suits. However, its hydrophobic property of not easily taking up water makes it unfit for the purpose of bath and dish towels (although examples of these made from shiny cotton are seen).

发光棉 缎

The term Egyptian cotton refers to the extra long staple cotton grown in Egypt and favored for the luxury and upmarket brands worldwide. During the U. S. Civil War, with heavy European investments, Egyptian-grown cotton became a major alternate source for British textile mills. Egyptian cotton is more durable and softer than American Pima cotton, which is why it is more expensive. Pima cotton is American cotton that is grown in the southwestern states of the U. S.

In South Asia, cotton is widely used in mattresses, which is the most common type of mattress used in that region.

褥子

1.2.1.4 Properties of Cotton Fibers 棉纤维性质

Table 1-1. Properties of cotton fibers.

[from: http://en.wikipedia.org/wiki/Cotton]

Property	Evaluation
Shape	Fairly uniform in width, 12—20 micrometers; length varies from 1 cm to 6 cm (½ to 2½ inches); typical length is 2.2 cm to 3.3 cm (⅞ to 1¼ inches).
Luster	high
Tenacity (strength) Dry Wet	 3.0—5.0 g/d 3.3—6.0 g/d
Resiliency	low
Density	1.54—1.56 g/cm^3

续表

Property	Evaluation
Moisture absorption	
raw: conditioned	8.5%
saturation	15－25%
mercerized: conditioned	8.5－10.3%
saturation	15－27%＋
Dimensional stability	good
Resistance to acids	damage, weaken fibers
alkali	resistant; no harmful effects
organic solvents	high resistance to most
sunlight	Prolonged exposure weakens fibers.
microorganisms	Mildew and rot－producing bacteria damage fibers.
insects	Silverfish damage fibers.
Thermal reactions	
to heat	Decomposes after prolonged exposure to temperatures of 150℃ or over.
to flame	Burns readily.

1.2.2 Flax 亚麻

Flax is native to the region extending from the eastern Mediterranean to India and was probably first domesticated in the Fertile Crescent. Flax was extensively cultivated in ancient Egypt.

Flax is an erect annual plant growing to 1.2 m tall, with slender stems. The leaves are glaucous green, slender lanceolate, 20-40 mm long and 3 mm broad. The flowers are pure pale blue, 15-25 mm diameter, with five petals; they can also be bright red. The fruit is a round, dry capsule 5-9 mm diameter, containing several glossy brown seeds shaped like an apple pip, 4-7 mm long.

蓝绿色/细长矛尖形

In addition to refer to the plant itself, "flax" may refer to the unspun fibers of the flax plant.

1.2.2.1 Uses 应用

Flax is grown both for its seeds and for its fibers. Various parts of the plant have been used to make fabric, dye, paper, medicines, fishing nets, hair gels and soap. It is also grown as an ornamental plant in gardens.

1.2.2.2 Flax Fibers 亚麻纤维

Flax fibers are amongst the oldest fiber crops in the world. The

use of flax for the production of linen goes back 5000 years. Pictures on tombs and temple walls at Thebes depict flowering flax plants. The use of flax fiber in the manufacturing of cloth in northern Europe dates back to Neolithic times. In North America, flax was introduced by the Puritans. Currently most flax produced in the USA and Canada are seed flax types for the production of linseed oil or flaxseeds for human nutrition.

Flax fiber is extracted from the bast or skin of the stem of the flax plant. Flax fiber is soft, lustrous and flexible. It is stronger than cotton fiber but less elastic. The best grades are used for linen fabrics such as damasks, lace and sheeting. Coarser grades are used for the manufacturing of twine and rope. Flax fiber is also a raw material for the high-quality paper industry for the use of printed banknotes and rolling paper for cigarettes. Flax mills for spinning flaxen yarn were invented by John Kendrew and Thomas Porthouse of Darlington in 1787.

韧皮

亚麻织物

麻线

1.2.2.3 Cultivation 种植

The linseed producing countries are Canada(～34%), China(～25.5%) and India (～9%), though there is also significant production in USA(～8%), Ethiopia(～3.5%) and throughout Europe. In the United States, three states, North Dakota, South Dakota, and Minnesota, raise nearly 100% of this plant.

The soils most suitable for flax, besides the alluvial kind, are deep friable loams, and containing a large proportion of organic matter. Heavy clays are unsuitable, as are soils of a gravelly or dry sandy nature. Farming flax requires few fertilizers or pesticides. Within six weeks of sowing, the plant will reach 10-15 cm in height, and will grow several centimeters per day under its optimal growth conditions, reaching 70-80 cm within fifteen days.

冲积土

易碎土壤

1.2.2.4 Maturation 成熟

Flax is harvested for fiber production after approximately 100 days, a month after the plant flowers and two weeks after the seed capsules form. The base of the plant will begin to turn yellow; if the plant is still green the seed will not be useful, and the fiber will be underdeveloped. The fiber degrades once the plant is brown.

1.2.2.5 Harvesting Methods 收割方法

There are two ways to harvest flax, one involving mechanized