应用型本科 机械类专业"十三五"规划教材



机械工程专业英语

主 编 肖 平 韩利敏

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机械工程专业英语

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内容简介

本书内容根据机械工程领域的知识特点分为机械工程材料、材料的成型方法、机械零部件、机械加工设备、工程机械设备、电气知识及汽车等六大部分。全书共30个单元,每个单元均包括课文和阅读材料两大部分,课文和阅读材料之后给出了词汇、注释、思考题等内容。本书内容的编写顺序与机械工程专业培养方案基本一致,这有助于读者阅读与学习。

本书可作为高等工科院校大机械类相关专业的英语教材,也可作为机械工程及相关专业的管理人员和技术人员自学参考用书。

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前 言

随着经济社会的迅速发展,我国已成为名副其实的制造业大国。国内的机械产品逐渐走向世界,同时世界著名的机械产品制造商也纷纷加入中国市场。这种技术大融合的时代背景和产业全球化的趋势必然要求培养大量既掌握机械领域专业知识又具备良好英语沟通能力的高级人才。为了使安徽省高等教育赶上并顺应时代发展的步伐,我们邀请了安徽省内一些机械工程专业较强的高校共同编写了这本《机械工程专业英语》。本书可作为大专院校机械工程专业的英语授课教材,也可以作为机械行业工程技术人员继续教育和职工岗位培训的教材,还可供专业技术人员熟悉专业词汇和学习机械工程专业英语使用。

本书共分为六大部分,每个部分分为五个单元进行介绍。第一部分为机械工程材料,主要讲述机械工程材料的类型及特点;第二部分为机械工程材料的成型方法,主要讲述机械工程材料的浇注、冲压等成型方法;第三部分为机械零部件,主要讲述机械工程领域中常用的零部件及其工作原理;第四部分为机械加工设备,主要介绍车床、铣床等常用加工设备;第五部分为工程机械设备,主要介绍挖土机、起重机等常用工程机械设备;第六部分为电气知识及汽车,主要介绍机械工程领域常用的电气设备原理及汽车领域相关知识。书中内容选自国外的专业书刊和大专院校教科书的部分章节,语言简明流畅,难易适中,实用性较强。通过学习本书,读者不仅可以提高英语水平,而且可以熟悉机械工程方面的专业知识。在编写本书的过程中,考虑到我国读者的英文水平,我们尽可能使每篇课文的篇幅适度,难度适中;为帮助读者克服阅读障碍,每篇课文后有注释和词汇表,课文中出现的长难句和语法难点均在课后的注释中加以解释。同时,本书的编写顺序与汽车类教材基本一致,这也有助于广大读者的阅读与理解。

我们编写本书的目的是希望读者通过学习本书,可以提高对机械工程专业 英文技术资料的理解能力以及对机械工程专业技术正确进行英文表达的能力。 这就需要读者在学习和阅读本书的过程中注重对本书专业词汇及固定英文表达

此为试读,需要完整PDF请访问: www.ertongbook.com

方式、方法的掌握。

本书由安徽工程大学肖平(第 1~第 10 单元)、韩利敏(第 11~第 20 单元)担任主编;嘉兴学院王娟(第 21、22、23 单元)、安徽工程大学秦广虎(第 24、25 单元)、安徽农业大学罗玉枝(第 26 单元)、蚌埠学院业红玲(第 27、28 单元)、安徽工业大学牛礼民(第 29、30 单元)担任副主编;安徽工程大学高洪教授担任主审。参加本书编写的人员还有安徽工程大学车辆工程教研室的时培成、王刚、潘道远、唐冶、周加冬、王海涛等老师,以及合肥工业大学夏锡全、安徽工业大学王永宽、安徽科技学院易克传、安徽农业大学张小龙、安徽工程大学外国语学院聂珺同学及硕士研究生聂高法等。

在本书编写过程中, 我们参阅了大量的书籍和文献资料, 受益匪浅, 在此向有关作者表示衷心的感谢!

由于编者水平有限,加上时间紧迫,书中疏漏之处在所难免,敬请广大专家和读者批评指正。

编 者 2017年2月

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PART 1 Materials

Unit I Engineering Materials

All products that come out of industry consist of at least one and often many types of materials. The most obvious example is the automobile. A car contains a wide variety of materials, ranging from glass to steel to rubber, plus numerous other metals and plastics.

The number of materials which are available to the engineer in industry is almost infinite. The various compositions of steel alone run into the thousands. It has been said that there are more than 10,000 varieties of glass, and the numbers of plastics are equally great. It addition, several hundred new varieties of materials appear on the market each month. This means that individual engineers and technicians cannot hope to be familiar with all the properties of all types of materials in their numerous forms. All that he can do is try to learn some principles to guide him in the selection and processing of materials.

The properties of a material originate from the internal structure of that material. This is analogous to saying that the operation of a TV set depends on the components and circuits within that set. The internal structures of materials involve atoms, and the way atoms are associated with their neighbors into crystals, molecules, and microstructures.

It is convenient to divide materials into three main types: (1) metals (2) plastics or polymers and (3) ceramics.

Characteristically, metals are opaque, ductile, and good conductors of heat and electricity. Plastics (or polymers), which usually contain light elements and have relatively low density, are generally insulators, and are flexible and formable at relatively low temperatures. Ceramics, which contain compounds of both metallic and nonmetallic elements, are usually relatively resistant to severe mechanical, thermal, and chemical conditions.

Metals are divided into ferrous and non-ferrous metals. The former contain iron and the latter do not contain iron. Certain elements can improve the properties of steel and are therefore added to it. For example, chromium may be included to resist corrosion and tungsten to increase hardness. Aluminum, copper, and the alloys, bronze and brass, are common non-ferrous metals.

Plastics and ceramics are non-metals; however, plastics may be machined like metals. Plastics are classified into two types: thermoplastics and thermosets. Thermoplastics can be shaped and reshaped by heat and pressure but thermosets cannot be reshaped because they undergo chemical changes as they harden. Ceramics are often employed by engineers when materials which can withstand high temperatures are needed.

New Words and Expressions

variety [vəˈraɪəti]

infinite ['InfInət]

composition [,kpmpə'zɪʃn]

property ['propati]

principle ['prinsapl]

originate [əˈrɪdʒɪneɪt]

internal [In't3:nl]

analogous [ə'næləgəs]

component [kəm'pəunənt]

crystal ['kristl]

molecule ['mɒlɪkju:l]

microstructure ['maɪkrəʊˌstrʌktʃə]

convenient [kən'vi:niənt]

polymer ['pɒlɪmə(r)]

ceramics [sɪ'ræmɪks]

characteristically [,kærəktə'rıstıkli]

opaque [əʊˈpeɪk]

ductile ['dʌktaɪl]

conductor [kənˈdʌktə(r)]

insulator ['insjuleitə(r)]

flexible ['fleksəbl]

formable ['fɔ:məbl]

compound [ˈkɒmpaʊnd]

metallic [məˈtælɪk]

ferrous ['ferəs]

chromium [ˈkrəʊmiəm]

corrosion [kəˈrəʊʒn]

tungsten [ˈtʌŋstən]

aluminum [əˈljuːminəm]

consist of

range from...to...

run into

associate with

the former...,the latter...

n. 多样性

adj. 无限的

n. 合成 (物)

n. 性能

n. 规则

vi. 起源

adj. 内部的

adj. 相似的

n. 一个部分

n. 晶体, 石英

n. 分子, 微小颗粒

n. 微结构

adj. 方便的

n. 聚合物

n. 陶瓷

adv. 典型地

adj. 模糊的

adi. 有韧性的,易延展的

n. 导体

n. 绝缘体

adj. 易弯曲的

adi. 易成型的

n. 化合物

adi. 金属的

adj. 亚铁的,含铁的

n. 铬

n. 腐蚀

n. 钨

n. 铝

由……组成

从 至

多达

与 … 相关

前者……,后者……

Questions

- 1. What materials does a car contain?
- 2. Why do individual engineers and technicians cannot be familiar with all types of materials of cars?
- 3. How can the materials of cars be divided?
- 4. What are the main features of metals, plastics and ceramics respectively?
- 5. When are ceramics often employed by engineers?

Reading Material: Metallic and Nonmetallic Materials

Perhaps the most common classification that is encountered in materials selection is whether the material is metallic or nonmetallic. The common metallic materials are such metals as iron, copper, aluminum, magnesium, nickel, titanium, lead, tin, and zinc and the alloys of these metals, such as steel, brass, and bronze. They possess the metallic properties of luster, thermal conductivity, and electrical conductivity; are relatively ductile; and some have good magnetic properties. The common nonmetals are wood, brick, concrete, glass, rubber, and plastics. Their properties are very wide, but they generally tend to be less ductile, weaker, and less dense than the metals, and they have no electrical conductivity and poor thermal conductivity.

Although it is likely that metals always will be the more important of the two groups, the relative importance of the nonmetallic group is increasing rapidly, and since new nonmetals are being created almost continuously, this trend is certain to continue. In many cases the selection between a metal and nonmetal is determined by a consideration of required properties. Where the required properties are available in both, total cost becomes the determining factor.

New Words and Expressions

v. 碰见 encounter [en'kaontal] n. 青铜 bronze [bra:nz] n. 光泽 luster ['lʌstəː] magnesium [mæg'ni:ziəm] n. 镁 nickel ['nɪkəl] n. 镍 n. 钛 titanium [tɪˈteɪniəm] 很可能 It is likely that... 必然,一定 It is certain to tend to 趋向于

- 1. Can you give some examples of common metallic materials?
- 2. Can you give some examples of common nonmetallic materials?
- 3. What properties do metallic materials have?
- 4. What properties do nonmetals have?
- 5. What determines the selection between a metal and a nonmetal?

Unit 2 Mechanical Properties of Metals

Mechanical properties are the characteristic responses of a material to applied forces. These properties fall into five broad categories: strength, hardness, elasticity, ductility, and toughness.

Strength is the ability of a metal to resist applied forces.

Strength properties are commonly referred to as tensile strength, bending strength, compressive strength, torsional strength, shear strength and fatigue strength.

Tensile strength is that property which resists forces acting to pull the metal apart^[1]. It is one of the most important factors in the evaluation of a metal.

Compressive strength is the ability of a material to resist being crushed. Compression is the opposite of tension with respect to the direction of the applied load^[2]. Most metals have high tensile strength and high compressive strength. However, brittle materials such as cast iron have high compressive strength but only a moderate tensile strength.

Bending strength is that quality which resists forces from causing a member to bend or deflect in the direction in which the load is applied. Actually a bending stress is a combination of tensile and compressive stresses.

Torsional strength is the ability of a metal to withstand forces that cause a member to twist.

Shear strength refers to how well a member can withstand two equal forces acting in opposite directions.

Fatigue strength is the property of a material to resist various kinds of rapidly alternating stresses. For example, a piston rod or an axle undergoes complete reversal of stresses from tension to compression. Bending a piece of wire back and forth until it breaks is another example of fatigue strength.

Hardness is that property in steel which resists indentation or penetration. Hardness is usually expressed in terms of the area of an indentation made by a special ball under a standard load, or the depth of a special indenter under a specific load^[3].

Elasticity is the ability to spring back to original shape. Auto bumpers and all springs should have this quality.

Ductility is the ability to undergo permanent changes of shape without rupturing. Modern, deep-formed auto bodies and fenders, and other stamped and formed products must have this property.

Toughness is the ability to absorb mechanically applied energy. Strength and ductility

determine a material's toughness. Toughness is needed in railroad cars, automobile axles, hammers, rails, and similar products.

New Words and Expressions

mechanical [mɪ'kænɪk(ə)l]

response [rɪ'spɒns]

broad [broid]

category ['kætɪg(ə)rɪ]

strength [stren θ ; strenk θ]

hardness ['haːdnəs]

elasticity [elæ'stɪsɪtɪ]

toughness ['txfnis]

tensile ['tensaɪl]

compressive [kəm'presiv]

torsional ['tɔːʃənəl]

shear [ʃɪə]

fatigue [fə'tiːg]

evaluation [ɪˌvæljuˈeɪʃn]

crush [krʌʃ]

tension ['tenʃ(ə)n]

brittle ['brɪt(ə)l]

cast iron

moderate ['mɒd(ə)rət]

member ['membə]

deflect [dɪ'flekt]

stress [stres]

twist [twist]

withstand [wið'stænd]

alternating ['ɔːltəneɪtɪŋ]

piston ['pɪst(ə)n]

axle ['æks(ə)l]

undergo [ʌndəˈgəʊ]

reversal [rɪ'vɜːs(ə)l]

indentation [Inden'teI \int (ə)n]

indenter [In'dentə]

penetration [peni'treif(ə)n]

adj. 力学的, 机械的

n. 反应, 响应, 答复

adj. 主要的,概括的

n. 种类, 类别

n. 强度

n. 硬度

n. 弹性, 弹力

n. 韧性

adj. 拉伸的

adj. 压缩的

adj. 扭转的

n. 剪切

n. 疲劳

n. 评价, 评定

v. 压碎

n. 拉伸, 绷紧

adj. 脆的

铸铁

adj. 适度的,温和的,中等的

n. 构件, 零件

v. 弯曲, 挠曲

n. 应力

v. 扭转, 捻

v. 抵抗, 经受住

adi. 交变的

n. 活塞, 柱塞

n. 车轴, 轮轴, 心棒

vt. 经历, 经受

n. 变换, 颠倒, 改变符号

n. 压痕, 凹痕

n. (硬度试验的) 压头

n. 穿透, 锥入程度

rupture ['rʌptʃə]
deep-formed
auto ['ɔːtəʊ]
bumper ['bʌmpə]
fender ['fendə]
stamp [stæmp]
fall into
be referred to as
with respect to

in terms of

v. 断裂 adj. 深成型的 n. 汽车; adj. 自动的 n. 汽车; adj. 自动的 n. 保险杠,缓冲器 n. 挡板,防护板 vt. 冲压,模压 分为 成为,叫做 就……而论,相对于

依据,根据

⇒ Notes

[1] Tensile strength is that property which resists forces acting to pull the metal apart. 参考译文: 抗拉强度是金属抵抗外力把它拉断的能力。

句中关系代词 which 引导一个定语从句修饰 property, 在从句中 which 作主语。此外, 在该从句中, 现在分词短语 acting to pull the metal apart 作定语修饰 forces。Pull...apart 意为 "把······拉开, 把······拉断"。

[2] Compression is the opposite of tension with respect to the direction of the applied load.

参考译文:压缩时载荷的方向与拉伸时的载荷方向相反。

该句中介词短语 with respect to the direction of the applied load 作全句的状语。

[3] Hardness is usually expressed in terms of the area of an indentation made by a special ball under a standard load, or the depth of a special indenter under a specific load.

参考译文: 硬度通常用在标准载荷作用下特制球产生的压痕面积来表示,或用特定载荷下专门压头所形成的深度来表示。

句中 the area...a standard load 和 the depth...a specific load 为并列的两个名词性短语,通过等立连词 or 连接,它们都是短语介词 in terms of 的宾语。介词短语 in terms of...a specific load 作全句的状语。

Questions

- 1. Which categories do the mechanical properties mainly fall into?
- 2. What is the definition of tensile strength?
- 3. What is hardness?
- 4. What is ductility?
- 5. What is toughness?

Reading Material: Stress and Strain

The fundamental concepts of stress and strain can be illustrated by considering a prismatic bar that is loaded by axial forces F at the ends, as shown in Figure 2-1. A prismatic bar is a straight structural member having constant cross section throughout its length. In this illustration, the axial forces produce a uniform stretching of the bar, hence, the bar is said to be in tension.

To investigate the internal stresses produced in the bar by the axial forces, we make an imaginary cut at section mn (Figure 2-1(a)).

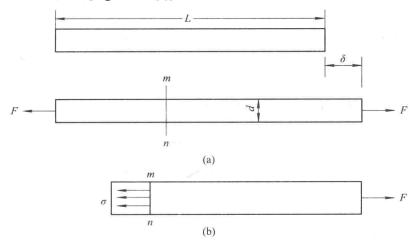


Figure 2-1 Prismatic bar in tension

This section is taken perpendicular to the longitudinal axis of the bar; hence, it is known as a cross section. We now isolate the part of the bar to the right of the cut as a free body (Figure2-1(b)). The tensile load F acts at the right end of the free body; at the other end are forces representing the action of removed part of the bar upon the part that remains. These forces are continuously distributed over the cross section, analogous to the continuous distribution of hydrostatic pressure over a submerged horizontal surface. The intensity of force (that is, the force per unit area) is called the stress and is commonly denoted by the Greek letter σ (sigma). Assuming that the stress has a uniform distribution over the cross section(see Figure 2-1(b)), we can readily see that its resultant is equal to the intensity σ times the cross-sectional area A of the bar. Furthermore, from the equilibrium of the body shown in Figure 2-1(b), it is also evident that this resultant must be equal in magnitude and opposite in direction to the applied load F. Hence, we obtain

$$\sigma = \frac{F}{A} \tag{2-1}$$

As the equation for the uniform stress in an axially loaded, prismatic bar of arbitrary cross-sectional shape. When the bar is stretched by the forces F, as shown in the figure, the