

高职高专“十二五”规划教材

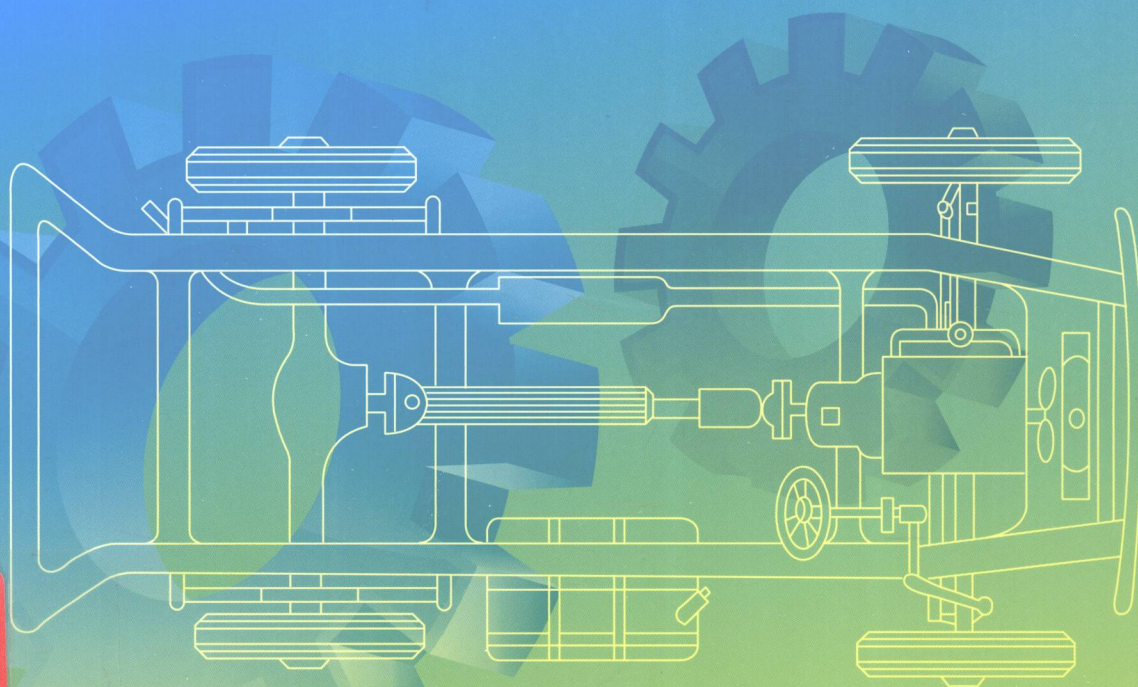
机械工程专业英语

陈燕 房菁 主编



JIXIE

GONGCHENG ZHUANYE YINGYU



化学工业出版社

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· 北 京 ·

本书共精选 13 个单元,其内容涉及:机械工程材料、热处理、焊接原理及类型、热加工技术、模具成型、数字控制、机械零件、机械加工和各类机床以及现代加工制造技术等,同时,在每一篇课文之后都附加了单词、难句详解、课后练习、专业英语翻译技巧和相关参考阅读等内容。内容全面,图文并茂,难度适中。在附录中还精选部分有关机电与数控、模具、焊接等领域的专业名词术语,以便于读者教学、自学和应用。

本书可作为高等职业技术学院、高等专科学校、成人教育学院、职工大学等大专层次的机械类专业英语教材或课外阅读材料,也可供工程技术人员参考。

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前 言

当今世界,高度发达的制造业和先进制造技术已经成为衡量一个国家综合经济实力和科技水平的最重要标志之一。制造业要发展,人才是关键。先进制造业要实现技术创新和技术升级必须尽快拥有一批高技能人才和高素质劳动者。为顺应中国制造业的深层次发展和现代制造技术的应用,提高高等职业技术学校学生以及广大工程技术人员在工作实践中科技英语的应用能力,我们编写了本教材。

本书根据科技英语的系统化教学方法安排内容,兼顾科技英语的词法、句法和文章阅读。每个单元由课文、翻译技巧及阅读材料三大部分组成,内容以机电一体化、模具制造、数控技术、焊接技术及其新发展为主。对课文和阅读材料中出现的重点和难点语言、语法现象均做了详细的注释,在夯实基础的同时,扩展专业词汇量。每篇课文和阅读材料选材精炼,既充分考虑现代机电设备的各个技术侧面又符合高职高专学生实际。课文后配有生词短语表、注释和相应的练习,促进学生学练结合,使学生能得到较为全面的现代机电技术专业英语方面的阅读和翻译技能训练。同时,将科技英语中的阅读方法贯穿于专业英语教学中,有针对性地加以训练,使学生掌握阅读技巧,提高学生科技英语的阅读能力。

本书每一单元形成一个技术侧面,完成专业英语学习的一个主题,使专业词汇、科技语法、专业知识融合为一体,形成互动互惠的学习机制。具体编写上注重实际阅读能力的训练,做到词汇由少到多,内容由浅入深,理解由易渐难。

本书由合肥通用职业技术学院陈燕和房菁任主编,桂瑞峰、吕艳凤参与了编写。本书在编写过程中得到了合肥通用职业技术学院江道银、邹积德和蒋腊芳的关心和支持,提出了许多宝贵的意见和建议。此外,姚建华、邢洁、张海涛等同志对本书的编写也做了大量工作,在此对他们表示衷心的感谢。

由于编者水平及知识所限,加之现代技术发展迅速,书中疏漏和不足之处在所难免,敬请读者批评指正。

编者
2012年5月

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Unit 1

Text

Steel and Cast Iron

It is known that metals are very important in our life. Metals have the greatest importance for industry.

Metals are divided into two general types-ferrous and nonferrous. Metals consisting of iron combined with some other elements are known as ferrous metals; all the other metals are called nonferrous metals.

Steel and cast iron are the most common ferrous metals in general use.

1. Steel

Steel theoretically is an alloy of iron and carbon. When produced commercially, however, certain other elements-notably manganese, phosphorus, sulfur, and silicon are present in small quantities. A wide range of physical properties may be obtained in steel by controlling the amount of carbon and other alloying elements and by subjecting the steel to various heat treatments.

There are two general kinds of steels: carbon steel and alloy steel.

(1) Carbon steels Carbon steels are classified according to the percentage of carbon they contain.

① Low carbon steel containing from 0.05 to 0.25 percent carbon. Steels in this class are tough, ductile, and easily machined, formed and welded. Low carbon steels are very soft and can be used for bolts and for machine parts that do not need strength.

② Medium carbon steel containing from 0.25 to 0.6 percent carbon. They are strong and hard but cannot be worked or welded as easily as low carbon steels.

③ High carbon steel containing from 0.6 to 1.7 percent carbon. High carbon steel may be hardened by heating it to a certain temperature and then quickly cooling in water. The more carbon the steel contains and the quicker the cooling is, the harder it becomes. Because of its high strength and hardness this grade of steel may be used for tools and working parts of machines.

But for some special uses, for example, for gears, bearings, springs, shafts and wire, carbon steels cannot be always used because they have no properties needed for these parts. Some special alloy steels should be used for such parts because the alloying elements make them tougher, stronger, or harder than carbon steels.

(2) Alloy steels Alloy steel contains some other "alloying elements" such as nickel, chromium, manganese, molybdenum, tungsten, vanadium, etc. Alloy steels have special properties determined by the mixture and the amount of other metals added. Some alloying

elements cause steels to resist rusting (corrosion), and such steels are called stainless steels. Stainless steels contain a high percentage of chromium. Chromium also makes steel harder. Nickel is used in steel to increase strength and toughness. Some alloying elements (such as chromium and tungsten) make the grain of steel finer, thus increasing the hardness and strength of steel, because the finer the grain is, the stronger the steel becomes.

2. Cast iron

Cast iron is used for the heavy parts of many machines. Cast iron is low in cost and wears well. It is very brittle, however, and cannot be hammered or formed. The basic kinds of cast iron are white iron, gray iron, nodular iron and malleable iron.

White cast iron is the hardest type of cast iron. It is unweldable.

The commonest type of cast iron is gray cast iron. Gray cast iron has little ductility, and can sustain high compressive loads.

Nodular iron is a variation of gray cast iron, and has a microscopic structure that overcomes most of the limitations of gray cast iron. Nodular iron likewise contains graphite, but the iron is inoculated with a small amount of magnesium while being poured into the ladle. As a result, the graphite becomes nodular or approximately spherical. The result is a cast iron with excellent ductility and tensile strength. Nodular iron is a kind of cast iron that is even better for withstanding shocks, blows, and jerks.

Malleable iron is a particular kind of cast iron, made more malleable by an annealing procedure. Malleable-iron castings are not so brittle or hard. They can stand a great deal of hammering. Many plumbing fixtures are made of malleable iron.

New words and phrases

ferrous	<i>adj.</i> 铁的, 含铁的
nonferrous	<i>adj.</i> 不含铁的, 非铁的
consist of	由…… 构成
element	<i>n.</i> 要素, 元素
be known as	被认为是……
ferrous metals	黑色金属
nonferrous metals	有色金属
alloy	<i>n.</i> 合金
manganese	<i>n.</i> 锰
phosphorus	<i>n.</i> 磷
sulfur	<i>n.</i> 硫
silicon	<i>n.</i> 硅
property	<i>n.</i> 性质, 特性
carbon steel	碳钢
alloy steel	合金钢
tough	<i>adj.</i> 强硬的, 坚韧的
ductile	<i>adj.</i> 可延伸的, 可塑的, 韧性的

weld	<i>vi.</i> 焊接; <i>n.</i> 焊接, 焊接点
bolt	<i>n.</i> 螺栓
strength	<i>n.</i> 强度
hardness	<i>n.</i> 硬度
nickel	<i>n.</i> 镍
chromium	<i>n.</i> 铬
molybdenum	<i>n.</i> 钼
tungsten	<i>n.</i> 钨
vanadium	<i>n.</i> 钒
mixture	<i>n.</i> 混合物
rust	<i>vi.</i> 生锈; <i>vt.</i> 使生锈; <i>n.</i> 铁锈
corrosion	<i>n.</i> 侵蚀, 腐蚀状态
stainless steel	不锈钢
brittle	<i>adj.</i> 易碎的, 脆的
hammer	<i>n.</i> 锤, 榔头; <i>vt. & vi.</i> 锤打 (击, 炼), 锻 (造)
nodular iron	球墨铸铁
malleable iron	可锻铸铁
ductility	<i>n.</i> 延展性, 韧性
sustain	<i>vt.</i> 支持, 维持
graphite	<i>n.</i> 石墨
magnesium	<i>n.</i> 镁
excellent	<i>adj.</i> 优秀的, 卓越的, 杰出的
shock	<i>n.</i> 打击, 振动
anneal	<i>vt.</i> 使……退火

Notes

1. The more carbon the steel contains and the quicker the cooling is, the harder it becomes.
 钢的含碳量越高, 冷却速度越快, 钢就变得越硬。

句中的 “the more..., the more...” 结构, 表示 “越……, 越……”。

本句中的比较状语从句为 “the more carbon the steel contain and the quicker the cooling is”, 主句为 “the harder it becomes”。句中的第一个 “the” 和第二个 “the” 均为副词, 分别引出两个并列的比较状语从句。

2. Some alloying elements (such as chromium and tungsten) make the grain of steel finer, thus increasing the hardness and strength of steel, because the finer the grain is, the stronger the steel becomes.

一些合金元素 (如铬、钨) 可细化钢的晶粒, 使钢的强度和硬度增加, 因为晶粒越细, 强度越高。

句中 “the finer the grain is, the stronger the steel becomes” 同样使用了 “the + 比较级, the + 比较级” 结构来表示 “越……, 越……”。

句中 “thus increasing the hardness and strength of steel, because the finer the grain

is, the stronger the steel becomes” 为现在分词短语作状语，作伴随情况的说明。

3. Nodular iron is a variation of gray cast iron, and has a microscopic structure that overcomes most of the limitations of gray cast iron.

球墨铸铁是灰铸铁的一个变种，它能够克服灰铸铁的大部分缺陷。

Exercises

1. Answer the following questions briefly:

(1) What can low carbon steels be used to make?

(2) What methods are available for improving the hardness of high carbon steel?

(3) Can carbon steels be used for gears, bearings, springs? Why?

(4) How do the alloying elements such as chromium and tungsten increase the hardness and strength of steel?

(5) How many general types of cast iron are there? What are they?

2. Write T (true) or F (false) beside the following statements according to the text:

(1) The properties of carbon steels depend not only on the percentage of carbon they contain, but also on the alloying elements. ()

(2) Steels contain more carbon than cast irons. ()

(3) Low carbon steel is harder than high carbon steel. ()

(4) Stainless steels contain some alloying elements which cause steels to resist corrosion. ()

(5) The finer the grain is, the stronger the steel becomes. ()

3. Translate the following sentences into Chinese:

(1) Metals consisting of iron combined with some other elements are known as ferrous metals; all the other metals are called nonferrous metals.

(2) A wide range of physical properties may be obtained in steel by controlling the amount of carbon and other alloying elements and by subjecting the steel to various heat treatments.

(3) Some alloying elements cause steels to resist rusting (corrosion), and such steels are called stainless steels.

(4) Nodular iron is a kind of cast iron that is even better for withstanding shocks, blows, and jerks.

Reading Skills

专业英语简介

在人类社会进入信息时代的今天，科学技术飞速发展，各国技术情报资料大量涌现，

国际学术交流日益频繁。由于历史的原因,目前国际上科技情报资料的交流主要是使用英语。对于计算机等电子类专业而言,85%以上的专业资料都是以英文形式出现的。英语也是目前我国科技工作中的首选外语,它已经成为一种强大的工具,在社会交往、信息传播、文化交流、科技发展中起到了极大的作用。

作为科技工作者,熟悉和掌握相关专业英语,了解科技英语结构,就能在科学技术上与世界同步,就能跟上社会前进的步伐,就能抢占科学技术的制高点。

一、专业英语的特点

专业英语(English for Special Science and Technology or English for Specific Purpose)与普通英语(Common English or General English or Ordinary English)既有联系,又有区别。

普通英语着重学习英语语法和句型结构,学习掌握宽泛的英语单词。在阅读方面,注重课堂上的精读,学习重点在于“word by word”,“sentence by sentence”,注重句中结构分析、语法词汇分析,这些都是学习英语所必需的。

专业英语的主要特点是:它具有很强的专业性,懂专业的人用起来得心应手,不懂专业的人用起来则困难重重。由于各个领域的专业英语都以表达科技概念、理论和事实为主要目的,因此,它们必然存在许多共同的特点。与普通英语相比,专业英语更注重客观事实和真理,并且要求逻辑性强,条理规范,表达准确、精炼、正式。其特点主要表现为两方面:一方面,专业英语的词汇和短语包含大量的专业术语、名词性词组、介词短语、合成新词、非限定性词组;另外,在句子结构方面,专业英语中经常出现长句、It...句型结构、被动语态、虚拟语气句、祈使句,其中祈使句广泛使用于说明书和手册中。此外,在专业英语中,插图、插画、表格、公式、数字所占比例较大。

专业领域中更多注重泛读:通过阅读各种典型的专业应用文体,扩大专业词汇量及知识面,理解词汇的发展、变异和灵活使用,从而提高专业英语的阅读、翻译、写作、听说的能力。

公共英语与专业英语这两者不是截然脱节的,而是并驾齐驱。学习专业英语时,既要掌握扎实的普通英语知识,又要注重结合专业技术的学习,这样才能真正提高专业英语水平。

二、专业英语的语法结构与特点

由于科学技术关心的不是个人的心理情绪,而是客观的普遍规律和对过程、概念的描述,因此专业英语应具有客观性及无人称性(Objectivity and Impersonality)要反映到语法结构上来。

专业英语的语法特点可以归纳为客观(Objectivity)、准确(Accuracy)和精炼(Conciseness)。

(一) 客观

专业英语的客观性指它所讨论的内容是客观的。为求客观,常用被动语态和一般现在时。据统计,专业英语中被动语态的句子要占 $1/3 \sim 1/2$ 。即使用了主动语态,主语也常常是无生命的(Inanimate Subject)。

就时态而言,因为专业资料所涉及的内容(如科学定义、定理、方程式或公式、图表等)一般并没有特定的时间关系,所以在专业英语中大部分都使用一般现在时。而过去将来时、完成进行时等,在专业英语中则很少出现。

(二) 准确

专业英语的准确性指意思表达要求准确,这是专业英语最基本的要求。准确性主要表现在用词上。例如为了准确精细地描述事物过程,所用句子都较长,有些甚至一段就是一个句子。长句可以反映客观事物中复杂的关系。

(三) 精炼

精炼指专业英语在表达形式上要求简洁、精炼。希望用尽可能少的单词来清晰地表达原意。因而导致了非限定动词、名词化单词、词组及其简化形式的广泛使用。

1. 动名词的运用

动名词短语可用于取代时间从句或简化时间陈述句。

通常的表达形式为:

When you use the mouse to click a button, you can select an option from a list.

相应的精炼表达形式为:

By using the mouse to click a button, you can select an option from a list.

2. 分词的运用

使用过去分词可以取代被动语态的关系从句,使用现在分词可以取代主动语态的关系从句。例如:

The plane which is flying at...

可用如下精炼形式表示为:

The plane flying at...

3. 不定式的运用

不定式短语可用以替换表示目的、功能的状语从句。例如:

We keep micrometers in boxes. Our object in doing this is to protect them from rust and dust.

可精炼地表示为:

We keep micrometers in boxes to protect them from rust and dust.

4. 其他简化形式

It is necessary to examine whether the new design is efficient.

相应的精炼形式为:

It is necessary to examine the efficiency of the new design.

5. 被动语态的运用

被动语态在科技文章中用得十分频繁,这主要有两个原因:一是科技文章重在描写行为或状态本身,注重客观的事实或道理,所以由谁或由什么行为或状态作为主体就显得不那么重要了。表现在句中常可以省去行为或状态的主体以简化语句。

被动语态使用频繁的另外一个原因是便于向后扩展句子,构成更长的句子,便于对问题作更精确的描述,但又不至于把句子弄得头重脚轻。

Reading Materials

Engineering Materials

The world is made up of matters. There are so many different types of materials in the world. We refer to the materials applied in engineering field as engineering materials. There are a lot of classification schemes about engineering materials. According to the chemical

element, engineering materials can be divided into metals and nonmetals. According to their use in manufacturing, engineering materials can be classified into two major categories: tool materials and work-part materials.

Metal materials have some fundamental capabilities, such as hardness, strength, density, thermal conductivity and so on. The most important metal materials in manufacturing are cast iron and steel. Cast iron and steel are both iron carbon. Cast iron usually contains 2 to 4.5 percent carbon, 0.5 to 3 percent silicon, and lesser amounts of sulfur, manganese, and phosphorus. It is hard, brittle and nonmalleable, so it is commonly used in casting into various shapes. Steel contains 0.2 and 1.5 percent carbon, often contains other constituents such as manganese, chromium, nickel, molybdenum, copper, tungsten, cobalt etc. to achieve certain properties needed. Steel is not only hard and strong, but malleable on account of lower carbon content, so it has been used more widely. There are also other metal materials used in manufacturing such as aluminum & aluminum alloy, copper & copper alloy, titanium alloy and so forth.

The most widely used nonmetal materials may be engineering plastics. Plastics are organic compounds produced by polymerization. The common engineering plastics can be grouped into two types that are thermoplastic and thermosetting plastics. Thermoplastics include PE (polyethylene), PVC (Polyvinyl Chloride), PP (polypropylene), PS (polystyrene), ABS, nylon, and so on. Thermosetting plastics include EP (epoxy), bakelite, and so on. Due to its good plasticity and fluidity, the plastic can not only be used in injection molding, but also be extruded or cast into shapes. The rubber is another major category in nonmetal materials. It can be divided into natural rubber and synthetic rubber according to the source of raw materials. Because of its high elasticity and electric insulation, rubber can be used in making tires, shock absorbers, airproof loops and electric insulation. Now more and more composites are used in engineering, especially in aerospace, biomedicine. Composites are combined with two or more distinct materials. It can be divided into three types: fiber-reinforced, particulate, and laminated composites, which is illustrated in Fig. 1-1.

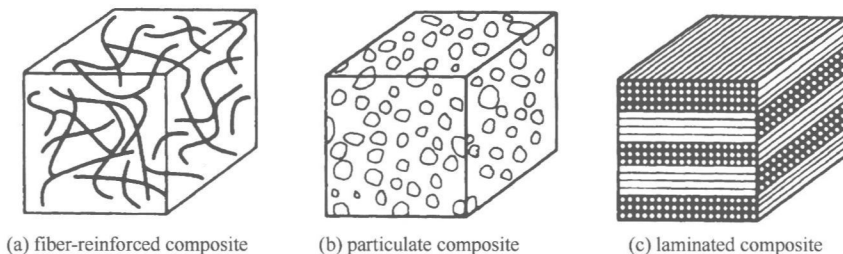


Fig. 1-1 Types of composites

Tool materials may be either metal or nonmetal. High-speed steel and carbide are the most widely used metal tool materials. Nonmetal tool materials include ceramic, diamond and CBN (Cubic Boron Nitride).

Work-part materials also involve metal and nonmetal. Plastics can be used in making

automobile lamps, panels, toys and so on. Metal can be used in manufacturing variety of parts. Take lathe as an example, Cast iron can be used in manufacturing headstock and bed. However, spindle and gears are made of steel.

Metal work-parts are ordinarily needed heat-treating operations (such as normalizing, anneal, temper and quencher) to enhance physical properties of materials.

New words and phrases

classification	<i>n.</i> 分类, 分级
scheme	<i>n.</i> 方案; 安排; 配置; 计划
density	<i>n.</i> 密度
thermal conductivity	<i>n.</i> 导热性
iron carbon	<i>n.</i> 铁碳合金
constituent	<i>n.</i> 成分, 要素
copper	<i>n.</i> 铜
cobalt	<i>n.</i> 钴
malleable	<i>adj.</i> 可锻的, 有延展性的
aluminum	<i>n.</i> 铝
titanium	<i>n.</i> 钛
organic	<i>adj.</i> 有机的; 器官的; 组织的
compound	<i>n.</i> 化合物
polymerization	<i>n.</i> 聚合, 聚合作用
thermoplastic	<i>adj.</i> 热塑性的; <i>n.</i> 热塑性塑料
thermosetting	<i>adj.</i> 热固性的
PE (polyethylene)	<i>n.</i> 聚乙烯
PVC (Polyvinyl Chloride)	<i>n.</i> 聚氯乙烯
PP (polypropylene)	<i>n.</i> 聚丙烯
PS (polystyrene)	<i>n.</i> 聚苯乙烯
ABS	<i>n.</i> 丙烯腈-丁二烯-苯乙烯, ABS 塑料
nylon	<i>n.</i> 尼龙, 聚酰胺纤维
EP (epoxy)	<i>n.</i> 环氧树脂
bakelite	<i>n.</i> 酚醛塑料; 胶木, 电木
fluidity	<i>n.</i> 流动性
injection molding	<i>n.</i> 注塑成型
synthetic	<i>adj.</i> 合成的; 人造的; 综合的
elasticity	<i>n.</i> 弹力, 弹性
laminated	<i>adj.</i> 薄板 [薄片] 状的; 层积的; 层压的
high-speed steel	<i>n.</i> 高速钢
ceramic	<i>n.</i> 陶瓷; <i>adj.</i> 陶瓷的
diamond	<i>n.</i> 金刚石; 钻石
CBN (Cubic Boron Nitride)	<i>n.</i> 立方氮化硼

headstock *n.* 主轴箱

Mechanical Properties of Metals

Mechanical properties are the characteristic responses of a material to applied forces. The knowledge of mechanical properties of materials is very essential in order to construct a mechanically sound structure such as a bridge on the river. Mechanical properties can be determined by conducting experimental tests on the material specimen. Some important mechanical properties of materials are: Strength, Stiffness, Ductility, Impact strength, Hardness, Toughness.

Strength. Strength or Mechanical Strength of a material may be defined as the ability of the material to sustain loads without undue distortion or failure. Material should have adequate strength when subjected to tension, compression, shear, bending or torsion as per the intended use.

Stiffness. Stiffness is the ability of a material or shape to resist elastic deflection. For identical shapes, the stiffness is proportional to the modulus of elasticity.

Ductility. Ductility refers to the capacity of material to undergo deformation under tension without rupture as in a wire drawing operation.

Impact strength. It is the strength of a material when subjected to high rates of loading, usually in bending, tension or torsion. The amount of energy required to fracture the material by a single blow is measured by means of a Charpy test.

Hardness. Hardness is the resistance of a material to plastic deformation usually by indentation. However, the term may refer to stiffness or refer to resistance to scratching, abrasion or cutting. Tests such as Vickers, Brinell and Rockwell are generally employed to measure hardness.

Toughness. Toughness refers to the ability of a material to withstand bending or the application of shear stresses without fracture.

New words and phrases

essential	<i>adj.</i> 主要的, 根本的
sound	<i>adj.</i> 健全的, 坚固的
conduct	<i>vt.</i> 实施, 进行, 指导
experimental	<i>adj.</i> 实施(性)的, 试验(用)的
specimen	<i>n.</i> 样品, 试样
strength	<i>n.</i> 强度
tension	<i>n.</i> 张力, 拉伸
compression	<i>n.</i> 压力; 压缩
shear	<i>n.</i> 剪(切)
bend	<i>vt.</i> 弯曲
stiff	<i>adj.</i> 刚(性)的

impact	<i>n.</i> 冲击
ductility	<i>n.</i> 延展性, 韧性
hardness	<i>n.</i> 硬度
toughness	<i>n.</i> 韧性, 韧度
sustain	<i>vt.</i> 支持, 维持
undue	<i>adj.</i> 过度的, 不适当的
distortion	<i>n.</i> 变形, 歪曲
elastic	<i>adj.</i> 弹性的
elasticity	<i>n.</i> 弹性
identical	<i>adj.</i> 相同的, 同一的
proportional	<i>adj.</i> 比例的, 相称的
plastic	<i>adj.</i> 塑料的, 可塑的
indentation	<i>n.</i> 压痕, 压坑
scratch	<i>n.</i> 划痕; <i>vt.</i> 划, 刻
abrasion	<i>n.</i> 擦伤, 磨损
fracture	<i>n.</i> 断裂, 破裂; <i>vi.</i> (使) 折断
bending strength	抗弯强度
be subjected to...	易受到
Charpy impact test	(摆锤式) 冲击试验
Vickers test	维氏硬度试验
Brinell test	布氏硬度试验
Rockwell test	洛氏硬度试验