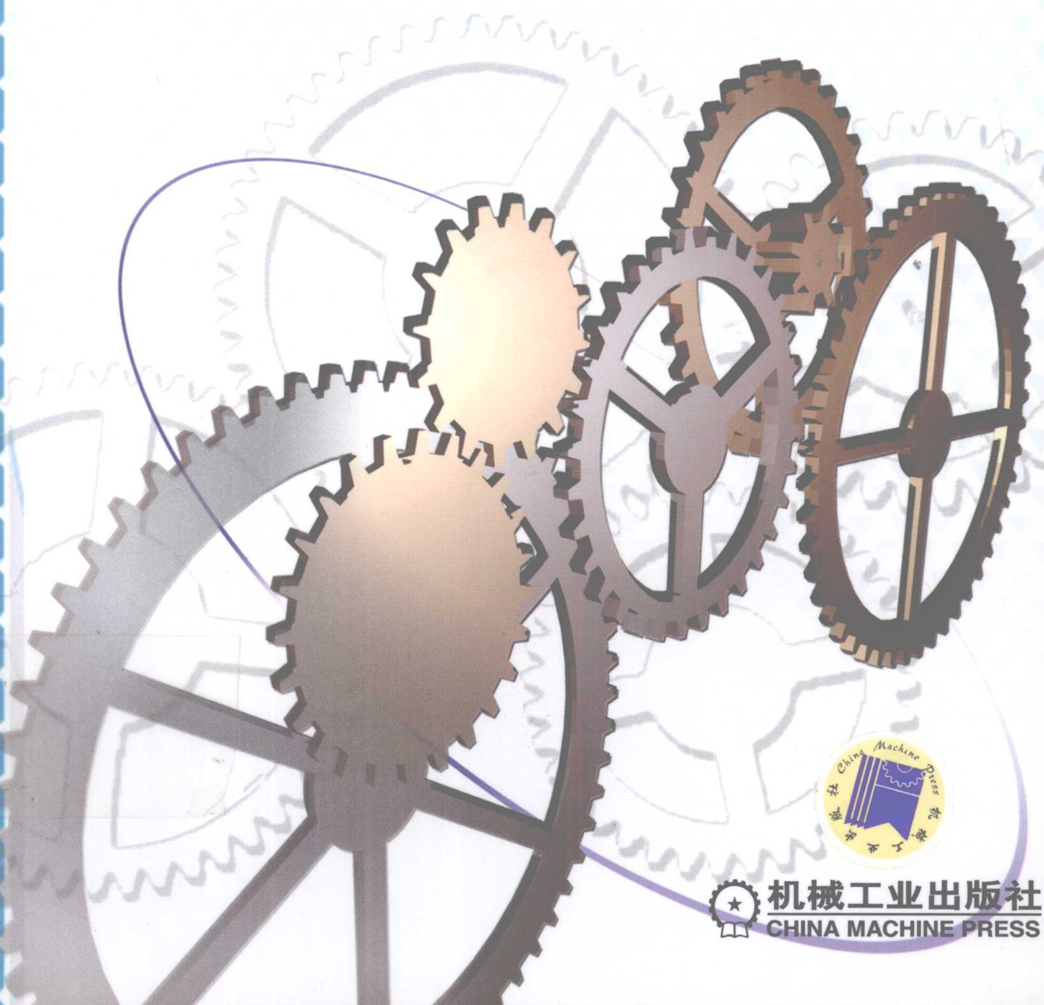
模具设计与制造专业英语规划教材

模具专业英语

MUJU ZHUANYE YINGYU

沈言锦　周钢　主编



机械工业出版社
CHINA MACHINE PRESS

● ISBN 978-7-111-25862-9
● 策划编辑：刘子峰 / 于奇慧

编辑热线：(010)88379759

地 址：北京市百万庄大街22号 邮政编码：100037
联系电话：(010)68326294
(010)68993821
网址：http://www.cmpbook.com(机工门户网)
E-mail:cmp@cmpbook.com
购书热线：(010)88379639 (010)88379641 (010)88379643

定价：23.00元

ISBN 978-7-111-25862-9
9 787111 258629 >

模具设计与制造专业英语规划教材

模具专业英语

主　编　沈言锦　周　钢
副主编　阳娣莎　沈延秀　周　健
参　编　张　坤　刘海渔　刘海雄
　　　　林章辉　孟少明　陈进武
　　　　陈艳辉　陈建山　刘银平
主　审　苏旭平

机械工业出版社

本书共分7部分，分别讲述了模具材料、冲压模、塑料模、模具CAD/CAM、模具设备、模具的电加工以及计算机数控等方面的专业英语知识。本书内容全面、精炼，选材新颖，难度适中，且每单元后都附有新单词和短语、重点和难点句子注释、练习题等内容。书后还附有常用的模具设计、制造方面的专业英语词汇和短语，供学生在学习和以后的工作中查询。

本书可作为高职高专模具设计与制造专业以及本科材料成型与控制专业的教材，也可以作为模具技术培训教材，还可以供从事模具设计、制造的技术人员和模具销售的外贸人员使用。

图书在版编目（CIP）数据

模具专业英语/沈言锦，周钢主编．—北京：机械工业出版社，2009.1
模具设计与制造专业英语规划教材
ISBN 978-7-111-25862-9

Ⅰ．模…　Ⅱ．①沈…②周…　Ⅲ．模具—英语—高等学校：技术学校—教材　Ⅳ．H31

中国版本图书馆CIP数据核字（2008）第214165号

机械工业出版社（北京市百万庄大街22号　邮政编码100037）
策划编辑：刘子峰　于奇慧　责任编辑：刘子峰
封面设计：赵颖喆　责任印制：杨　曦
三河市宏达印刷有限公司印刷
2009年1月第1版第1次印刷
184mm×260mm·14印张·342千字
0001—4000册
标准书号：ISBN 978-7-111-25862-9
定价：23.00元

凡购本书，如有缺页、倒页、脱页，由本社发行部调换
销售服务热线电话：（010）68326294
购书热线电话：（010）88379639　88379641　88379643
编辑热线电话：（010）68354423
封面无防伪标均为盗版

前　言

本书是根据教育部“关于加强高职高专教育教材建设的若干意见”和高职高专模具专业教学大纲编写而成，从教学实际出发，力求专业培养的宽口径，具有良好的通用性、实用性和针对性。遵照高等职业教育的应用特性，教材内容力求通俗易懂，便于教学和自学。

本书共分7部分，分别讲述了模具材料、冲压模、塑料模、模具CAD/CAM、模具设备、模具的电加工、计算机数控等方面的专业英语知识。本书内容全面、精炼，选材新颖，难度适中，且每单元后都附有新单词和短语、重点和难点句子注释、练习题等内容。书后还附有常用的模具设计、制造方面的专业英语词汇和短语，供学生在学习和以后的工作中查询。本书在编排上力求突出实用性，具有以下几个特点：

1. 每个单元的内容在编排上重点突出。各单元文章后有与之配套的阅读材料，可扩充相关领域的知识，满足英文功底较好的读者的需求。

2. 阅读内容贴切实用，选取的单词专业性强，便于学生日后应用。

3. 图文并茂，专业词汇用图形示意，便于学生理解和学习。

本书由沈言锦和周钢担任主编，阳娣莎、沈延秀、周健担任副主编，参加编写的老师还有张坤、刘海渔、刘海雄、林章辉、孟少明、陈进武、陈艳辉、陈建山、刘银平等，全书由湘潭大学苏旭平教授担任主审。

由于编者水平有限，书中难免有不足之处，恳请读者批评指正。

编者

Contents

PartⅣ Die & Mold CAD / CAM

Part V Die & Mold Equipment

Part Ⅵ Die & Mold EDM

Part Ⅶ Computerized Numerical Control

Appendix

Part Ⅰ　Die & Mold Materials

Unit 1

Text

Properties of Metals

The properties of metals are the characteristics that determine how the metal will react under varying conditions. [1] The two principal types of properties are physical and mechanical. Physical properties are those fixed properties that are determined naturally and cannot be changer, such as weight, mass, color, and specific gravity. Mechanical properties, on the other hand, are those properties of metal that can be changed or modified to meet a particular need, such as strength, hardness, wear resistance, toughness, plasticity, and ductility.

Strength

Strength is a property of metal that allows it to resist permanent change in shape when loads are applied. Four types, or forms, of strength you should know are: tensile strength, shear strength, compressive strength, and ultimate strength. The value used to express these relative strengths is pounds per square inch, or psi, which is the force in pounds required to fracture, deform, or break a sample piece that is 1 in. wide and 1 in. thick.

Tensile Strength——The ability of a metal to resist being pulled apart by force acting in a straight line is tensile strength. Tensile strength is the value most commonly used for indicating the strength of a metal.

Shear Strength——The ability of a metal to resist being broken by forces acting in opposite directions is shear strength.

Compressive Strength——The ability of a metal to resist forces and pressure acting on a single plane is compressive strength.

Ultimate Strength——The maximum strength of the material before fracture, rupture, or deformation is the ultimate strength.

Hardness

Hardness is the ability of a metal to resist indentation or penetration. Several different methods are used to measure the hardness of a metal; however, the two primary methods, or test, used by industry are the Brinell and Rockwell hardness tests. A comparison of the values used in each of these tests is shown in Figure 1-1.

Figure 1-1 Comparison of Brinell and Rockwell Hardness Values

Rockwell (HRC)	Brinell (HB)	Rockwell (HRC)	Brinell (HB)
64	722	42	390
62	688	40	371
60	654	38	353
58	615	36	336
56	577	34	319
54	543	32	301
52	512	30	286
50	481	28	271
48	455	26	258
46	432	24	247
44	409	22	237

Wear Resistance

Wear resistance is the ability of a metal to resist abrasion. In most cases, the harder the metal, the better it resists wear.

Toughness

Toughness is the ability of a metal to resist, or absorb, sudden shocks of loads without breaking.

Plasticity

Plasticity is the ability of a metal to be extensively deformed without fracture or rupture.

Ductility

Ductility is the ability of a metal to be stretched, or drawn, without fracture. Ductility can also be described as the plasticity shown by a metal under a pulling, or tensional, load.

Malleability

Malleability is the ability of a metal to be flattened, hammered, or rolled without fracture. Malleability is also the plasticity shown by a metal under a compressive load.

Brittleness

Brittleness is the property of a metal that causes it to fracture rather than deform when loads are applied[2]. Brittleness is the opposite of plasticity.

Machinability and Weldability

Although machinability and weldability are not true mechanical properties, they are measures of a metal's ability to be machined or welded easily.

Knowledge of these mechanical properties will help you select the proper metal to meet any requirement. In addition to knowing mechanical properties, you must also be familiar with the various metals commonly used in the machine shop.

New Words and Phrases

characteristic [ˌkæriktəˈristik] *n.* 特征，特性
strength [streŋθ] *n.* 强度
hardness [ˈhɑːdnis] *n.* 硬度
toughness [ˈtʌfnis] *n.* 韧性
ductility [dʌkˈtiliti] *n.* 延展性
plasticity [plæsˈtisiti] *n.* 塑性
indentation [ˌɪndenˈteiʃən] *n.* 印痕，凹痕
abrasion [əˈbreiʒən] *n.* 磨损
fracture [ˈfræktʃə] *v./n.* 破裂，破碎
rupture [ˈrʌptʃə] *v./n.* 破裂，断裂
deformation [ˌdifɔːˈmeiʃən] *n.* 变形
shock [ʃɔk] *v./n.* 冲击，震动
brittleness [ˈbritlnis] *n.* 脆性
malleability [ˌmæliəˈbiliti] *n.* 有延展性，可锻性
compressive strength 抗压强度
tensile strength 抗拉强度
shear strength 抗剪强度
mechanical property 力学性能
wear resistance 耐磨性
ultimate strength 极限强度
Rockwell hardness 洛氏硬度
Brinell hardness 布氏硬度
physical property 物理性能

Notes

[1] The properties of metals are the characteristics that determine how the metal will react under varying conditions.

句中 the properties of metals 是主语，are 是谓语，characteristics 是宾语，that 引导宾语从句修饰 characteristics。

金属材料的性能是指金属在不同条件下的反应特性。

[2] Brittleness is the property of a metal that causes it to fracture rather than deform when loads are applied.

句中 rather than 译为“不是”，连接两个并列成分，when 引导状语从句充当全句的状语。

脆性是指材料在载荷作用下不产生明显变形而直接发生破坏的特性。

Exercises

Ⅰ. Answer the following questions briefly according to the text.

1. What are the two principal types of properties of metals?
2. What are the four types of strength a machinist should be familiar with?
3. What are the two primary hardness tests used by industry?

Ⅱ. Choose the best answer.

1. Hardness is the ability of a metal to ________.
   a. resist shocks　　b. resist indentation
   c. resist being flattened　　d. resist abrasion
2. What is the ability of a metal to be extensively deformed called?
   a. Plasticity　　b. Ductility
   c. Malleability　　d. Brittleness
3. What property of a metal is the opposite of brittleness?
   a. Toughness　　b. Hardness
   c. Ductility　　d. Plasticity

Translating Skills

科技英语翻译方法与技巧——省略法

由于汉语和英语在结构和用法上存在差异，为更好地将原文意思表述清楚，英译汉时英文中有些词语不必译出，这种方法称为“省略法”。

1. 省略冠词。例如：

Wear resistance is the ability of a metal to resist abrasion.

耐磨性是材料抵抗磨损的能力。(省略了冠词 the 和 a)

2. 省略代词或关系代词。例如：

Nonferrous metals are those metals whose major element is not iron.

非铁金属材料是主要合金元素非铁的金属材料。(省略了代词 those 和关系代词 whose)

By the word “alloy” we mean “mixture of metals”.

用“合金”这个词来表示“金属的混合物”。(省略了代词 we)

3. 省略结构用词。例如：

These alloys generally contain more carbon, tungsten, and cobalt than do the standard alloy steels.

这种合金一般比普通合金含更多的碳、钨和钴。(省略了表示强调的结构助词 do)

4. 省略形式主语或形式宾语。例如：

When designing a bending die, it is necessary to consider springback that occurs after unloading.

设计弯曲模时，需要考虑卸载后的回弹现象。(省略了形式主语 it)

Reading Material

Die Life and Die Failure

Proper selection of die material and of the die manufacturing technique determines, to a large extent, the useful life of forming dies. Dies may have to be replaced for a number of reasons, such as changes in dimensions due to wear or plastic deformation, deterioration of the surface finish, and cracking or breakage. In hot impression die forging, the principal modes of die failure are erosion, thermal fatigue, mechanical fatigue and plastic deformation.

In erosion, also commonly called die wear, material is actually removed from the die surface by pressure and sliding of the deformed material, wear resistance of the die material, die surface temperature, relative sliding speed at the die/material interface and the nature of the interface layer are the most significant factors influencing abrasive die wear. Thermal fatigue occurs on the surface of the die impression in hot forming and results in "heat checking". Thermal fatigue results from cyclic yielding of the die surface due to contact with the hot forming material. This contact causes the surface layers to expand, and, because of the very steep temperature gradients, the surface layers are subject to compressive stressed. At sufficiently high temperatures, these compressive stressed may cause the surface layers to deform. When the die surface cools, a stress reversal may occur and the surface layers will then be in tension. After repeated cycling in this manner, fatigue will cause formation of a crack pattern that is recognized as heat checking. Die breakage or cracking is due to mechanical fatigue and occurs in cases where the dies are overloaded and local stresses are high. The dies are subjected to alternating stresses due to loading and unloading during the deformation process, and this cause crack initiation and eventual failure.

Die life and die failure are greatly affected by the mechanical properties of the die materials under the conditions that exist in a given deformation process. Generally, the properties that are most significant depend on the process temperature. Thus, die materials used in cold forming processes are quite different from those used in hot forming.

The design and manufacture of dies and the selection of die materials are very important in the production of discrete parts by use of metal forming process. The dies must be made by modern manufacturing methods from appropriate die materials in order to provide acceptable die life at a reasonable cost. Often the economic success of a forming process depends on die life and die costs per piece produced. For a given application, selection of the appropriate die material depends on three types of variables:

(a) Variables related to the process itself, including factors such as size of the die cavity, type of machine used and deformation speed, initial stock size and temperature, die temperature to be used, lubrication, production rate and number of parts to be produced.

(b) Variables related to the type of die loading, including speed of loading, i.e., impact or gradual contact time between dies and deforming metal (this contact time is especially important in hot forming), maximum load and pressure on the dies, maximum and minimum die temperatures, and number of loading cycles to which the die will be subjected.

(c) Mechanical properties of the die material, including hardenability, impact strength, hot strength and resistance to thermal and mechanical fatigue.

New Words and Phrases

deterioration [diˌtiəriəˈreiʃən] *n.* 变坏，退化，损耗

lubrication [ˌluːbriˈkeiʃən] *n.* 润滑

impression [imˈpreʃən] *n.* 模膛，压痕

discrete [disˈkriːt] *adj.* 单个的

layer [ˈleiə] *n.* 层

cavity [ˈkæviti] *n.* 型腔

interface [ˈintə(ː)ˌfeis] *n.* 接触面，界面

stock [stɔk] *n.* 坯料，原材料

abrasive [əˈbreisiv] *n./adj.* 磨损（的）

die life 模具寿命

die failure 模具失效

surface finish 表面粗糙度

thermal fatigue 热疲劳

mechanical fatigue 机械疲劳

heat checking 热裂纹

Unit 2

Text

Ferrous Metals

Metals are divided into two general groups: ferrous metals and nonferrous metals. Ferrous metals are those metals whose major element is iron. The major types of ferrous metals are irons, carbon steels, alloy steels and tool steels.

Iron

The iron ore which we find in the earth is not pure. It contains some impurities which we must remove by smelting. The process of smelting consists of heating the ore in a blast furnace with coke and limestone, and reducing it to metal. Blasts of hot air enter the furnace from the bottom and provide the oxygen which is necessary for the reduction of the ore. [1] The ore becomes molten, and its oxide combines with carbon from the coke. The non-metallic constituents of the ore combine with the limestone to form a liquid slag. This floats on top of the molten iron, and passes out of the furnace through a tap. The metal which remains is pig-iron, and consists of approximately 93 percent iron, 5 percent carbon, and 2 percent impurities.

Remelting pig iron and scrap iron in a furnace to remove some of the impurities produces cast iron. [2] The type, or grade, of cast iron is determined by the extent of refining, the amounts of pig iron and scrap iron, and the methods used to cast and cool the metal.

The three primary types of cast iron are gray cast iron, white cast iron, and malleable iron. Gray cast iron is primarily used for cast frames, automobile engine blocks, handwheel, and cast housings. White cast iron is hard and wear resistant and is used for parts such as train wheels. Malleable cast iron is a tough material used for tools such as pipes and wrenches. Generally, cast irons have very good compressive strength, corrosion resistance, and good machinability. The main disadvantage of cast iron is its natural brittleness.

Carbon Steel

Carbon steel is made from pig iron that has been refined and cleaned of most impurities. Most of the original carbon in the metal is burned out during the refining process. Measured amounts of carbon are then added to the molten metal to produce the exact grade of carbon steel desired. After the steel is poured into ingots and allowed to cool, it is usually sent to a rolling mill to be rolled and formed into specific shapes. [3]

The three principal types of carbon steel used in industry are low, medium, and high carbon steel. The percentage of carbon is the most important factor in determining the mechanical properties of each type of carbon steel.

Low carbon contains between 0.05% and 0.30% carbon and is primarily used for parts that do not require great strength. Typical uses of low carbon steel include chains, bolts, screws, washers, nuts, pins, wire, shafting, and pipes. This metal is also known as machine steel, mild steel, and cold-rolled steel. Low carbon steel is tough, ductile material that is easily machined and welded. It is useful for parts that must be stamped or formed.

Containing between 0.30 and 0.50% carbon, medium carbon steel is used for parts that required great strength than is possible with low carbon steel, such as gears, crankshafts, machine parts and axles. Because this steel has higher carbon content, it can be heat-treated to increase both hardness and wear resistance. Medium carbon steel is a tough, hardenable metal that has good machinability and is easily welded.

Containing between 0.50 and 1.70% carbon, high carbon steel is used for parts that require hardness and strength, such as files, knives, drills, razors, and woodworking tools. Due to their increased carbon content, high carbon steels can be heat-treated to make them harder and more wear resistant than low or medium carbon steels. Due to their great hardness, high carbon steels are often brittle.

Alloy Steels

Alloy steels are basically carbon steels with elements added to modify of change the mechanical properties of the steel. All steels are alloy steels because each is a combination of elements, including carbon steel, a mixture of iron and carbon. To identify the two groups, one is called carbon or plain steel and the other is referred to as alloy steel.

Alloying elements are added to the molten steel in measured amounts. The desired end product determines the elements and amounts added. The primary alloying elements and their effect on the steel are as follows:

Boron——The hardenability of an alloy is increased by boron. Only very small amounts of boron are needed to increase the hardenability characteristics of the other elements in the alloy.

Chromium——When used in small amount, chromium increases the depth hardness of the metal. The more chromium used, the better the alloy resists corrosion. Chromium is a principal element in stainless steels.

Cobalt——Cobalt is added to an alloy to increase wear resistance and increase red hardness, which is the ability of a metal to maintain a cutting edge at elevated temperature. Cobalt is a valuable addition to some high-speed tool steels.

Lead——By reducing the cutting friction, lead improves machinability. Leaded steels also have good weldability and formability.

Manganese——Impurities in alloy steels are controlled by using manganese as a purifier and scavenger. When added in larger amount (1 to 15 percent), manganese produces good hardness and wear resistance.

Molybdenum——A tough alloy suitable for a wide range of high-strength applications, molybdenum steel permits good depth hardness and strength at elevated temperatures.

Nickel——High-strength alloys resistant to both elevated temperatures and corrosion are produced by nickel. When alloyed with molybdenum, nickel steel becomes a very tough alloy, which is often used for many aircraft parts. Larger amounts of nickel greatly add to the corrosion resistance of stainless steels.

Phosphorus and Sulfur——Free-machining carbon steels are produced with phosphorus and sulfur. When alloyed with carbon steels, phosphorus and sulfur produce alloys with excellent machining characteristics.

Tungsten——When alloyed with steel, tungsten produces a variety of high-speed tool steels and adds hardenability and strength at elevated temperatures as well as high resistance to wear.

Vanadium——A tough, fine-grained steel that acts as a cleanser and purifier to eliminate many of the impurities of steel is produced by vanadium.

Tool Steels

Tool steels are a special grade of alloy steels used for making a wide variety of tools. Depending on their composition, tool steels are highly resistant to wear, shocks, and heat. These alloys generally contain more carbon, tungsten, and cobalt than do the standard alloy steels. [4] Another principal difference between most alloy steels and tool steels is the control with which elements are added. Tool steels are made with much closer quality controls than are other alloy steels.

New Words and Phrases

coke [kəuk] *n.* 焦炭
smelt [smelt] *v.* 精炼，冶炼
limestone [ˈlaimˌstəun] *n.* 石灰石
housing [ˈhauziŋ] *n.* 机架
ingot [ˈiŋgət] *n.* 铁锭，铸型
roll [rəul] *v.* 轧，碾
bolt [bəult] *n.* 螺栓，螺钉
nut [nʌt] *n.* 螺母
shafting [ˈʃaːftiŋ] *n.* 轴系
washer [ˈwɔʃə] *n.* 垫圈
file [fail] *n.* 锉刀
boron [ˈbɔːrɔn] *n.* 硼
cobalt [ˈkəubɔːlt] *n.* 钴
lead [led] *n.* 铅
chromium [ˈkrəumjəm] *n.* 铬
manganese [ˈmæŋgəniːz] *n.* 锰
molybdenum [məˈlibdinəm] *n.* 钼
nickel [ˈnikəl] *n.* 镍
phosphorus [ˈfɔsfərəs] *n.* 磷
sulfur [ˈsʌlfə] *n.* 硫
tungsten [ˈtʌŋstən] *n.* 钨
vanadium [vəˈneidiəm] *n.* 钒