新世纪高职高专
模具设计与制造类课程规划教材

新世纪

模具专业英语

MUJU ZHUANYE YINGYU

(第三版)

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主编 肖伟平 谢英星
主审 刘庚武

大连理工大学出版社
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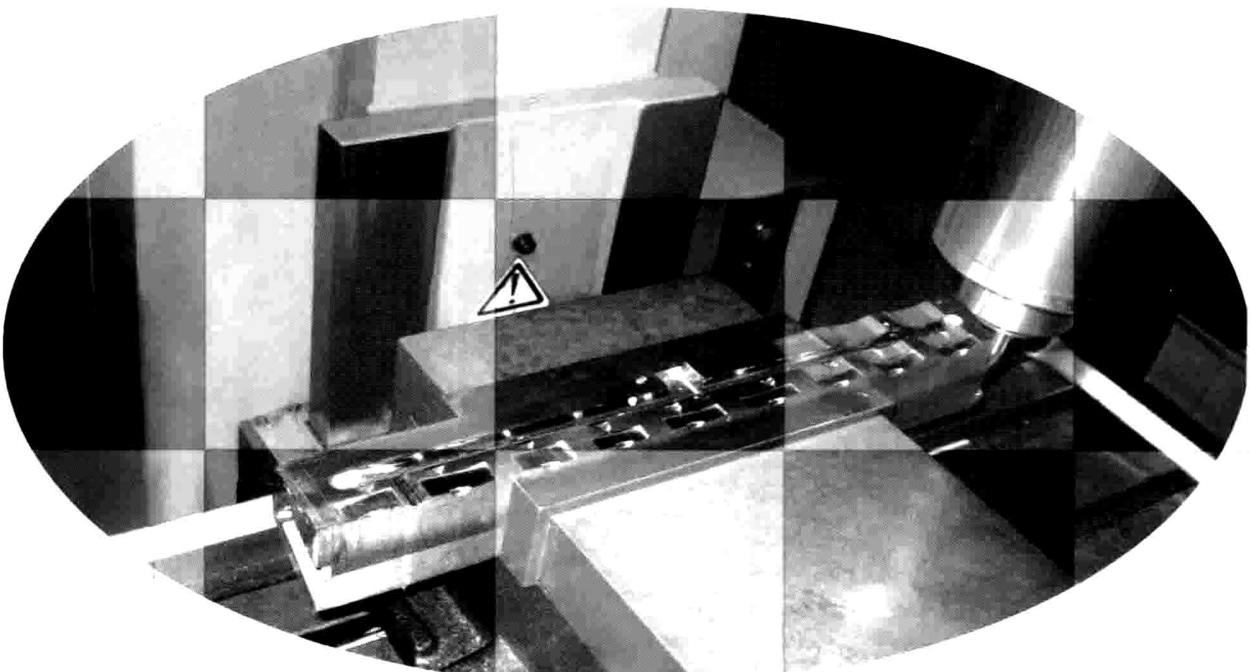

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总　序

我们已经进入了一个新的充满机遇与挑战的时代，我们已经跨入了21世纪的门槛。

20世纪与21世纪之交的中国，高等教育体制正经历着一场缓慢而深刻的革命，我们正在对传统的普通高等教育的培养目标与社会发展的现实需要不相适应的现状作历史性的反思与变革的尝试。

20世纪最后的几年里，高等职业教育的迅速崛起，是影响高等教育体制变革的一件大事。在短短的几年时间里，普通中专教育、普通高专教育全面转轨，以高等职业教育为主导的各种形式的培养应用型人才的教育发展到与普通高等教育等量齐观的地步，其来势之迅猛，发人深思。

无论是正在缓慢变革着的普通高等教育，还是迅速推进着的培养应用型人才的高职教育，都向我们提出了一个同样的严肃问题：中国的高等教育为谁服务，是为教育发展自身，还是为包括教育在内的大千社会？答案肯定而且惟一，那就是教育也置身其中的现实社会。

由此又引发出高等教育的目的问题。既然教育必须服务于社会，它就必须按照不同领域的社会需要来完成自己的教育过程。换言之，教育资源必须按照社会划分的各个专业(行业)领域(岗位群)的需要实施配置，这就是我们长期以来明乎其理而疏于力行的学以致用问题，这就是我们长期以来未能给予足够关注的教育目的问题。

如所周知，整个社会由其发展所需要的不同部门构成，包括公共管理部门如国家机构、基础建设部门如教育研究机构和各种实业部门如工业部门、商业部门，等等。每一个部门又可作更为具体的划分，直至同它所需要的各种专门人才相对应。教育如果不能按照实际需要完成各种专门人才培养的目标，就不能很好地完成社会分工所赋予它的使命，而教育作为社会分工的一种独立存在就应受到质疑(在市场经济条件下尤其如此)。可以断言，按照社会的各种不同需要培养各种直接有用人才，是教育体制变革的终极目的。

随着教育体制变革的进一步深入，高等院校的设置是否会同社会对人才类型的不同需要一一对应，我们姑且不论。但高等教育走应用型人才培养的道路和走研究型（也是一种特殊应用）人才培养的道路，学生们根据自己的偏好各取所需，始终是一个理性运行的社会状态下高等教育正常发展的途径。

高等职业教育的崛起，既是高等教育体制变革的结果，也是高等教育体制变革的一个阶段性表征。它的进一步发展，必将极大地推进中国教育体制变革的进程。作为一种应用型人才培养的教育，它从专科层次起步，进而应用本科教育、应用硕士教育、应用博士教育……当应用型人才培养的渠道贯通之时，也许就是我们迎接中国教育体制变革的成功之日。从这一意义上说，高等职业教育的崛起，正是在为必然会取得最后成功的教育体制变革奠基。

高等职业教育还刚刚开始自己发展道路的探索过程，它要全面达到应用型人才培养的正常理性发展状态，直至可以和现存的（同时也正处在变革分化过程中的）研究型人才培养的教育并驾齐驱，还需要假以时日；还需要政府教育主管部门的大力推进，需要人才需求市场的进一步完善发育，尤其需要高职教学单位及其直接相关部门肯于做长期的坚忍不拔的努力。新世纪高职高专教材编审委员会就是由全国100余所高职高专院校和出版单位组成的旨在以推动高职高专教材建设来推进高等职业教育这一变革过程的联盟共同体。

在宏观层面上，这个联盟始终会以推动高职高专教材的特色建设为己任，始终会从高职高专教学单位实际教学需要出发，以其对高职教育发展的前瞻性的总体把握，以其纵览全国高职高专教材市场需求的广阔视野，以其创新的理念与创新的运作模式，通过不断深化的教材建设过程，总结高职高专教学成果，探索高职高专教材建设规律。

在微观层面上，我们将充分依托众多高职高专院校联盟的互补优势和丰裕的人才资源优势，从每一个专业领域、每一种教材入手，突破传统的片面追求理论体系严整性的意识限制，努力凸现高职教育职业能力培养的本质特征，在不断构建特色教材建设体系的过程中，逐步形成自己的品牌优势。

新世纪高职高专教材编审委员会在推进高职高专教材建设事业的过程中，始终得到了各级教育主管部门以及各相关院校相关部门的热忱支持和积极参与，对此我们谨致深深谢意，也希望一切关注、参与高职教育发展的同道朋友，在共同推动高职教育发展、进而推动高等教育体制变革的进程中，和我们携手并肩，共同担负起这一具有开拓性挑战意义的历史重任。

新世纪高职高专教材编审委员会

2001年8月18日

第三版前言

《模具专业英语》(第三版)是新世纪高职高专教材编审委员会组编的模具设计与制造类课程规划教材之一。

随着加工制造业水平的不断提高和国家对职业教育的日益重视,高职高专模具专业人才在市场上逐渐供不应求。在技术革新越来越快、竞争越来越激烈的现代化社会,如何保持行业的专业性、超前性,也成了模具专业学生必须面对的问题。在近年来的教学中,从事模具专业英语教学的老师越来越感觉到,学生学好模具专业英语不仅是提高自身素质的需要,更是拓展学生视野以及培养模具专业创新型、应用型技术人才的需要。正是基于这样的需求,几位具有模具专业英语教学和模具行业从业经验的一线教师合作编写了这本兼顾基础性、延展性、高效性的专业英语教材。

本教材将模具专业基础知识浓缩为五大单元,涉及模具材料、注射模具设计、锻压成形及模具设计、模具加工技术、模具报价与结算方面的内容,大部分文章选自相关专业教材或专业刊物原文。在保持前一版教材写作风格的基础上,编者对本版教材进行了一系列的改进和完善,具体表现如下:

1. 替换了一些文章,新增了适应行业发展的最新模具专业的素材,大大充实了教材的内容。

2. 全书图文并茂,与专业课程联系紧密,每课课文后都附有新单词、词组注释、互动练习等模块。其中互动练习模块的实用性较强,着重训练学生的归纳和总结能力,加强学生对专业知识的理解,方便教师与学生在课堂上的交流互动,同时也可提高学生的学习兴趣。

3. 为扩大学生的阅读范围并补充知识量,本教材在每一篇课文后都安排了阅读材料,以供学有余力的学生阅读,也可选择其中部分内容作为课后作业。

4. 为方便教师教学,本教材配有电子课件。

本教材可作为高等职业院校、高级技师学院模具设计

与制造等相关专业的教材，也可供相关工程技术人员参考使用。

本教材由中山职业技术学院肖伟平、谢英星任主编，安徽职业技术学院刘艳华、中山职业技术学院陈传端任副主编。全书由谢英星统稿，肖伟平定稿。湖南铁道职业技术学院刘庚武老师审阅了全书并提出了许多宝贵的意见和建议，在此深表感谢！

尽管我们在探索教材特色的建设方面做出了许多努力，但由于编者水平有限，教材中仍可能存在一些错误和不足，恳请各教学单位和读者在使用本教材时多提宝贵意见，以便下次修订时改进。

所有意见和建议请发往：dutpgz@163.com
欢迎访问我们的网站：http://www.dutpbook.com
联系电话：0411-84707424　84706676

编　者
2011年11月

第一版前言

《模具专业英语》是新世纪高职高专教材编审委员会组编的模具设计与制造类课程规划教材之一。

本教材适应现阶段模具制造业的发展趋势，根据企业对技术人员的专业英语水平有较高要求以及模具制造技术各专业分化越来越细的特点，有针对性地结合了当前模具行业的最新技术，并充分体现了模具行业自身特有的选材、制造加工和工艺技术。

本教材在编写的过程中力求突出如下特点：

1. 面向广大高职教育对象，以能力培养为本位，以实用、简洁、够用为度，旨在提高读者的科技英语阅读能力，扩充学生的专业英语词汇量。阅读课文中的长、难句配有注释，以分析句型和句子成分；每篇文章后都配有参考译文，帮助读者全面理解课文内容。

2. 在选取科技文章时，力求基础性与专业性知识兼顾，注意降低相关专业知识难度，收录专业最新、最实用的词汇和用语，反映专业特色及专业发展的最新知识。

3. 文中生词的注释不像以往只放在文章结束的地方，而是同时标注在正文的一侧，便于读者阅读。文中生词、短语以粗体出现，便于读者记识。

4. 本教材在内容上注重选材新颖实用，力求采用地道的英语表达；在形式上注重生动活泼，图文并茂。

本教材共分五个单元，分别是：Mold Materials and Heat Treatment; Mold Processes; Mold Constructions; Manufacturing Technology of Mold; CAD/CAM/CAE。

本教材由江苏联合学院苏州机电分院杨成美任主编；南京工业职业技术学院林贵霞、江苏联合学院苏州机电分院沈爱军、苏州工业园区职业技术学院陆伟任副主编。具

新世纪

体编写分工如下：杨成美编写第 1、5 单元；林贵霞、陆伟共同编写第 2、3 单元；沈爱军编写第 4 单元。杨成美负责全书的统稿。广东轻工职业技术学院朱派龙老师、南京工业职业技术学院滕宏春老师审阅了全书，并提出了许多宝贵意见和建议，在此深表感谢！

尽管我们在教材特色的建设方面做出了许多努力，但由于编者水平有限，教材中仍可能存在一些疏漏和不妥之处，恳请各教学单位和读者在使用本教材时多提宝贵意见，以便下次修订时改进。

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编　者

2007 年 8 月

目　录

Unit One

Mold Materials

Lesson 1 Polymers

The word polymer literally means "many parts". A polymeric solid material may be considered to be one that contains many chemically bonded parts or units which themselves are bonded together to form a solid.[1] Two industrially important polymeric materials are plastics and elastomers. Plastics are a large and varied group of synthetic materials which are processed by forming or molding into shape. Just as we have many types of metals such as aluminum and copper, we have many types of plastics such as polyethylene and nylon. Plastics can be divided into two classes: thermoplastics and thermosetting plastics, depending on how they are structurally and chemically bonded.[2] Elastomers or rubbers can be elastically deformed a large amount when a force is applied to them and can return to their original shape (or almost) when the force is released.

We are all pretty aware of the various plastic/polymer products in our life. The left of Fig. 1-1 is a montage of typical plastic extrusion products. Alongside, we see recognizable applications of polymers: modern telecommunications equipment and the ski boot.

Fig. 1-1 Polymers products

The basic building block of a plastic is the polymer molecule, a long chain of covalent-bonded atoms, such as the one shown in Fig. 1-2. Secondary bonds then hold groups of polymer chains together to form the polymeric material. Excerpt from the polymer web pages of the Department of Chemistry of the Imperial College of Science, Technology and

Medicine in the UK.

Engineers over the world use heat-shrinkable tubing instead of standard approaches for insulation, such as taping or molding in place. The tubing comes in a wide range of sizes, colors, and materials. When heated, it shrinks to conform to the size and shape of the underlying material, making installation fast and easy.

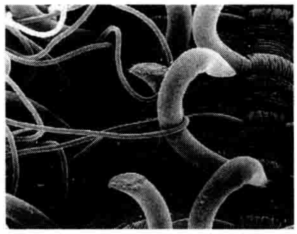
Fig. 1-2 VELCRO

Synthetic fabrics are man-made copies of natural fabrics. Synthetic fabrics do not occur in nature by themselves but are usually derivatives of petroleum products. Examples of common synthetic fabrics are polyester, spandex, rayon, and velcro. The image of Fig. 1-2 is VELCRO(hook side). A plant in nature gave the inventor of VELCRO the idea for the product.

Hook and Loop fabric fasteners were invented in 1941 by George de Mestral after a day of hunting in the Jura Mountains in France. Carefully inspecting the burs in his wool pants and his dog's coat, he found hundreds of little hooks engaging the loops in the material and fur. De Mestral made a machine to duplicate the hooks and loops in nylon. He called his new product VELCRO1 Fasteners, from the French words VELours and CROchet.

We are all familiar with liquid crystal display (LCD) devices, image Fig. 1-3. Do you know liquid crystals are polymeric materials? A liquid crystal is, as the name suggests, a state of matter intermediate between a "normal" liquid and a solid. Liquid crystal phases are formed from geometrically anisotropic molecules. Usually this means they are cigar shaped, though other shapes are possible. In a liquid crystal phase, the polymer molecules have a certain degree of order. In the simplest case, the Nematic phase, the molecules generally point in the same direction but still move around with respect to one another as would be expected in a liquid.[3] Under the influence of an applied electric field, alignment of the polymer molecules gives rise to light absorption.

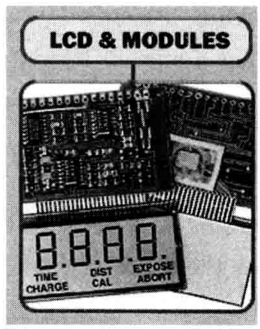

Fig. 1-3 LCD devices

New Words

literally /ˈlitərəli/ *adv.* 照字面意义地，逐字地
polymeric /ˌpɔliˈmerik/ *adj.* 聚合的
industrially /inˈdʌstriəli/ *adv.* 工业地
elastomer /iˈlæstəmə(r)/ *n.* 弹性体
synthetic /sinˈθetic/ *n.* 合成物
aluminum /əˈljuːminəm/ *n.* 铝

copper	/ˈkɔpə/	*n.* 铜
nylon	/ˈnailɔn/	*n.* 尼龙
thermoplastics	/ˌθəːməˈplæstiks/	*n.* 热塑性塑料
thermosetting	/ˌθəːməuˈsetiŋ/	*adj.* 热固的
telecommunication	/ˌtelikəmjuːniˈkeiʃən/	*n.* 电信
molecule	/ˈmɔlikjuːl, ˈməu-/	*n.* 分子
covalent-bonded		*n.* 共价键
insulation	/ˌinsjuˈleiʃən/	*n.* 绝缘品
underlying	/ˌʌndəˈlaiiŋ/	*adj.* 隐藏着的
man-made		*adj.* 人造的
derivative	/diˈrivətiv/	*n.* 派生物
petroleum	/piˈtrəuliəm/	*n.* 石油
duplicate	/ˈdjuːplikeit/	*v.* 复制
liquid crystal display		液晶显示屏
geometrically anisotropic molecules		*adv.* 几何学上
alignment	/əˈlainmənt/	*n.* 排成一行

Notes

① A polymeric solid material may be considered to be one that contains many chemically bonded parts or units which themselves are bonded together to form a solid.
高分子固体物质被认为是一种由很多化学分子和元素聚合成的固体物质。
that 引导的定语从句修饰前面的"one","considered to be..."词组是"被认为是……"的意思。

② Plastics can be divided into two classes: thermoplastics and thermosetting plastics, depending on how they are structurally and chemically bonded.
塑料可分为两类:热塑性塑料和热固性塑料,这取决于它们的结构和化学合成方式。
"depend on..."词组译为"取决于……"。

③ In the simplest case, the Nematic phase, the molecules generally point in the same direction but still move around with respect to one another as would be expected in a liquid.
最简单的情况下,在向列相,分子通常向同一方向移动,但也会像在液体中那样相互周向运动。

互动练习

常用注塑材料的性能特点及用途

1. 聚乙烯(PE)的性能特点:质软,机械性能差,表面硬度低,化学稳定性较好,不耐强氧化剂,耐水性好。主要用途:管、绳、容器、电器绝缘零件、日用品等。

2. 聚丙烯(PP)的性能特点:化学稳定性好,耐寒性差,光、氧作用下易降解,机械性能比聚乙烯好。主要用途:板、片、透明薄膜、绳、绝缘零件、汽车零件、阀门配件、日用品等。

3. 聚氯乙烯(PVC)的性能特点:不耐强酸和碱类溶液,能溶于甲苯、松节油等,其他性能取决于配方。主要用途:薄膜、管、板、容器、电缆、人造革、鞋类、日用品等。

4. 聚酰胺(PA)的性能特点:通称尼龙,抗拉强度、硬度、耐磨性、自润滑性突出,吸水性强,化学稳定性好,能溶于甲醛、苯酚、浓硫酸等。主要用途:耐磨零件及传动件,如齿轮、凸轮、滑轮等;电器零件中的骨架外壳、阀类零件、日用品等。

常用注塑材料还有很多,由于篇幅关系,在此就不一一列举了。

参考译文

聚合物

聚合物的字面意思是"很多部分"。高分子固体物质被认为是一种由很多化学分子和元素聚合成的固体物质。两种重要的工业高分子材料是塑料和橡胶。塑料是一种应用广泛、种类繁多的合成物,可以通过冲压或注塑加工成型。正如我们有很多诸如铝、铜这样的金属一样,我们也有很多类型的塑料,如聚乙烯和尼龙。塑料可分为两类:热塑性塑料和热固性塑料,这取决于它们的结构和化学合成方式。当外力作用于弹性体或橡胶时,弹性体或橡胶会发生弹性变形;当外力撤销时,它们会恢复原来的形状。

我们非常了解日常生活中有很多种类型的塑料或聚合物。图 1-1 左图是各种典型的塑料挤压产品。右边两图是可以识别出的应用聚合物:现代通讯设备及滑雪靴。

图 1-1 聚合物产品

塑料的基本构成是聚合物分子,一条由共价键原子组成的长链,如图 1-2 所示。次级纽带将聚合物群体连在一起形成高分子材料,摘自帝国理工学院化学系聚合物网站。

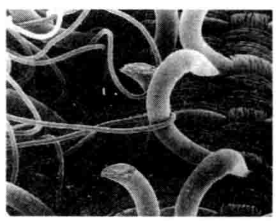

图 1-2 尼龙搭扣

世界各地的工程师用热收缩管而不是标准方法来隔离绝缘,如在一个地方贴紧或者做一个模具。热收缩管分为多种尺寸、颜色和材料,当受热时,它会自动收缩以顺应基本材料的大小和形状,使安装方便快捷。

合成纤维织物是人工仿造天然织物的产物。合成纤维通常是石油产品的衍生物,本身性质不会发生改变。常见的合成织物有涤纶、氨纶、人造丝和尼龙搭扣。尼龙搭扣(钩边)的

图像如图 1-2 所示。发明家从自然界的一种植物获得了生产尼龙搭扣的灵感。

1941 年,George de Mestral 在法国汝拉山区打了一天猎后发明了钩环紧固器。他仔细检查了自己的羊毛裤和狗皮外套上扎的刺后,在衣料和毛皮上发现了数以百计的小钩和小环。他给新发明起的名字叫 VELCRO1 紧固器,VELCRO1 取自法语天鹅绒和编织器。

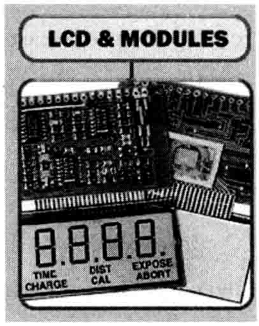

图 1-3 液晶显示器装置

我们都很熟悉液晶显示器(LCD)装置,如图 1-3 所示。你知道液晶显示器是高分子材料吗?液晶,顾名思义,是介于液体和固体之间的物质。液晶相是由各向异性的几何分子形成,虽然也有其他形状的可能,但它们通常是雪茄形状。液晶状态下聚合物分子有一定的排列顺序。最简单的情况下,在向列相,分子通常向同一方向移动,但也会像在液体中那样相互周向运动。在应用电场的影响下,调整聚合物分子将引起光吸收。

阅读材料

Alloy

An alloy is a partial or complete solid solution of one or more elements in a metallic matrix. Complete solid solution alloys give single solid phase microstructure, while partial solutions give two or more phases that may be homogeneous in distribution depending on thermal (heat treatment) history. Alloys usually have different properties from those of the component elements.

Alloying one metal with other metal(s) or non metal(s) often enhances its properties. For instance, steel is stronger than iron, its primary element. The physical properties, such as density, reactivity, Young's modulus, and electrical and thermal conductivity, of an alloy may not differ greatly from those of its elements, but engineering properties, such as tensile strength and shear strength may be substantially different from those of the constituent materials. This is sometimes due to the sizes of the atoms in the alloy, since larger atoms exert a compressive force on neighboring atoms, and smaller atoms exert a tensile force on their neighbors, helping the alloy resist deformation. Alloys may exhibit marked differences in behavior even when small amounts of one element occur. For example, impurities in semi-conducting ferromagnetic alloys lead to different properties, as first predicted by White, Hogan, Suhl, Tian Abrie and Nakamura. Some alloys are made by melting and mixing two or more metals. Brass is an alloy made from copper and zinc. Bronze, used for bearings, statues, ornaments and church bells, is an alloy of copper and tin.

Unlike pure metals, most alloys do not have a single melting point. Instead, they have a melting range in which the material is a mixture of solid and liquid phases. The temperature at which melting begins is called the solidus and the temperature when melting is complete is called the liquidus. However, for most alloys there is a particular proportion of constituents (in rare cases two) which has a single melting point. This is called the alloy's eutectic mixture, as shown in Fig. 1-4.

In practice, some alloys are used so predominantly with respect to their base metals that the name of the primary constituent is also called as the name of the alloy. For example, 14 karat gold is an alloy of gold with other elements. Similarly, the silver used in jewelry and the aluminium used as a structural building material are also alloys.

The term "alloy" is sometimes used in everyday speech as a synonym for a particular alloy. For example, automobile wheels made of aluminium alloy are commonly referred to as simply "alloy wheels". The usage is obviously indefinite, since steels and most other metals in practical use are also alloys.

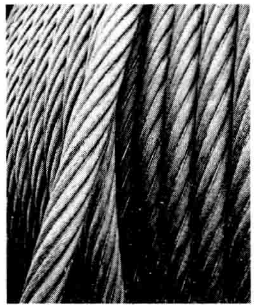

Fig. 1-4 Steel is a metal alloy whose major component is iron, with carbon content between 0.02% and 2.14% by mass

Lesson 2 Mold Materials

Depending on the processing parameters for the various processing methods as well as the length of the production run, i. e., the number of finished products to be produced, molds must satisfy a great variety of requirements. It is therefore not surprising that, molds can be made of a very broad spectrum of materials, including such exotic materials as paper match and plaster. However, because most processes require high pressures, and often combined with high temperatures, metals still represent by far the most important material group, with steel being the predominant metal. It is interesting in this regard that, in many cases, the selection of the mold material is not only a question of material properties and an optimum price-to-performance ratio but also the methods used to produce the mold, and thus the entire design can be influenced.

A typical example can be seen in the choice between cast metal molds and machined molds, with their very different cooling systems. In addition, the production technique can also have an effect. For instance, it is often reported that, for the sake of simplicity, a prototype mold is frequently machined from solid stock with the aid of the latest technology such as computer aided design (CAD) and computer integrated manufacturing (CIM). In contrast to the previously used methods based on the use of patterns, the use of CAD and CIM often represents the more economical solution today, not only because this production capability is available in-house but also because with some other technique an order would have to be placed with an outside supplier.

Overall, although high-grade materials are often used, as a rule, standard materials are used in mold making. New, high-performance materials, such as ceramics, for instance, are almost completely absent. This may be related to the fact that their desirable characteristics, such as constant properties up to very high temperature, are not required in molds, whereas their negative characteristics, e. g. , low tensile strength and poor thermal conductivity. Having a clear relation to ceramics, sintered material, is found in mold making only to a limited degree. This refers less to the modern materials and components produced by powder metallurgy, and possibly by hot isostatic pressing, than to sintered metals in the sense of porous, air-permeable materials.

Removal of air from the cavity of a mold is a necessary with many different processing methods, and it has been proposed many times that this can be accomplished using porous metallic materials.[①] The advantages over specially fabricated venting devices, particularly in areas where melt flow fronts meet, i. e. , at weld lines, are as obvious as the problem areas: On one hand, preventing the texture of such surfaces from becoming visible on the finished product, and on the other hand, preventing the micropores from quickly becoming clogged with residues. It is also interesting in this case that completely new possibilities with regard to mold design and processing technique resulted from the use of such materials. The process steps of venting, cooling, and ejecting in relation to the use of sintered metals can be best illustrated with the aid of the sketches shown in Fig. 1-5.

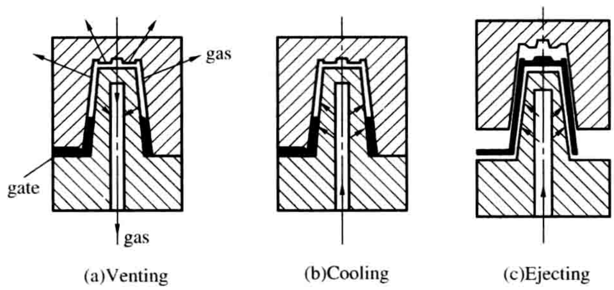

Fig. 1-5 Microporous metal ejecting in a mold

Venting of the edge-gated cavity used to produce a cup-shaped product with a complex bottom would require a great deal of technical effort to provide guaranteed removal of the air from the bottom region.[②] By using a microporous material for the core and cavity halves, no additional measures for venting are required. Moreover, because venting takes place over the entire surface area of the cavity, filling of the cavity can occur faster, and there is, in principle, freedom in selecting the location of the gate.

It is particularly difficult to remove the necessary amount of heat in regions with long, narrow cores. In this case, it is possible to distribute cold gas via the system of micropores in the core and in this way intensify the cooling, with the possible result of achieving a shorter cycle time.[③]

Improved temperature uniformity over the mold surface can be another beneficial side effect.

It is also possible, in combination with other means(ejectors, stripper rings)or even without them, to eject the product by injecting gas at high pressure into the core half of