机械设计制造及其自动化
英语教程

周志雄 孙宗禹 主编

湖南大学出版社

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内 容 简 介

本书根据全国高等学校大学英语教学指导委员会新修订的《大学英语教学大纲》的要求编写，目的是培养学生阅读和翻译专业书刊的能力。本书体系新颖、题材丰富、涉及面广，突破了传统同类教材的编排模式。

全书分为两篇。第一篇为专业英语的翻译和阅读材料，内容包括：金属材料、热处理、机械零件、金属切削机床、刀具、金属切削原理、特种加工技术、制造过程、可靠性分析、装配、经济性分析、控制技术及计算机技术在机械制造过程中的应用、加工中心、柔性制造系统、制造技术的新发展等。第二篇为科技英语翻译技巧，系统地归纳和总结了科技英语的翻译理论和技巧。因此，本书具有较强的实用性和知识延伸性。

本书可作为大专院校机械设计、制造及其自动化专业（含机械制造工艺及设备、机械制造及其自动化、机械设计及理论、机械工程、机械电子工程等专业方向）及相近专业的专业英语教材，也适用于成人教育及职工培训，还可供机械类工程技术人员参考。

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前　言

全国高等学校大学英语教学指导委员会于1999年公布了新的适用于大学非英语专业的《大学英语教学大纲(修订本)》。这个大纲将大学英语教学分为基础阶段和应用提高阶段,后者又包括了专业英语和高级英语。大纲对各阶段的教学提出了明确的要求,其中对专业英语的要求有:专业英语为必修课,教学时数应不少于100学时,课外学习时数的比例应不低于1:2;词汇——领会式掌握1 000~1 500本专业及与本专业有关的常用单词,以及由这些词构成的常用词组;阅读能力——能顺利阅读有关专业的原版教科书、参考书及其他参考资料,能掌握中心大意,抓住主要事实和有关细节,阅读速度达到每分钟100~120词。对其中重要的论著和文献等材料能正确理解、抓住要点,并能对内容进行分析、推理、判断和综合概括,阅读速度达到每分钟70词。阅读量为250 000词;译的能力——能借助词典将有关专业的英语文章译成汉语,理解正确,译文达意,译速为每小时350英语单词。能借助字典将内容熟悉的有关汉语文字材料译成英语,译文达意,无重大语言错误,译速为每小时300~500汉字。可见,"专业英语"课是在学生经过了英语基础阶段的教学之后,主要是为进一步提高大学高年级学生阅读和翻译有关专业书刊的能力而开设的,主要目的是培养和提高学生准确阅读和翻译专业书刊的能力。为此,需要进行大量的阅读和翻译练习。

本书是在湖南大学"机械设计、制造及其自动化"专业(含机械制造工艺及其设备、机械制造及其自动化、机械电子工程、机械设计及理论等专业方向)近几年来使用的专业英语教材基础上重新编写而成的。原书经国内20余所高校使用,受到师生的好评。全书分为两篇,第一篇为专业英语的翻译和阅读材料;第二篇为科技英语翻译技巧。第一篇的所有材料均取自于英文原版专著。在本书的编写过程中,每课正文后列出了词汇表,并对长句、难句作了注释。参照"大学英语教学大纲",将四级英语所要求的基本词汇以外的生词及专业词汇尽可能收列在正文生词表或词汇表中。通过本书的学习,不仅能使学生明显提高阅读和翻译专业书刊的能力,而且可以大大地增加专业词汇量,扩展专业知识面。第二篇系统地归纳和总结了科技英语的翻译技巧,试图让学生较全面地掌握科技英语翻译的理论和基本知识,增强学生英译汉以及阅读理解科技英语原文的能力。

在编写本书的过程中,充分考虑到"大纲"的要求,所以,内容较多,篇幅较大。教学时,教师可根据各校所安排的课内学时将第一、二篇结合起来,选讲其中部分内容,而其他的内容可作为学生的课外阅读或翻译练习之用。

本书适合于作大专院校机械设计、制造及其自动化专业(含机械制造工艺及其设备、机械制造及其自动化、机械设计及理论、机械电子工程和机械工程等专业方向)以及相近专业的专业英语教材,也可作为机械类工程技术人员的参考书。为便于组织教学,本书没有附加译文和练习答案,而将全部译文编成《机械设计、制造及其自动化英语教程教师用书》,另行印刷,供教学参考。

本书编写分工为:第一篇:第一章、第四章、第五章由周志雄编写,第二章由刘少凤编写,第三章由邓朝晖编写,第六章由孙宗禹编写;第二篇由孙宗禹、周志雄编写。全书由周志雄、孙宗禹统稿。

全书承湖南大学外国语学院高桂萍仔细审阅，提出了许多宝贵中肯的意见。在编写过程中，得到了张丽玲、罗红平等同志的大力协助，同时中南大学的蒋炳炎、黄志辉等老师，湖南大学机械制造及其自动化和机械电子工程专业近几届的部分同学也为本书的编写提出了宝贵的意见，在此一并表示感谢。此外，在编写过程中也参考了近若干年出版的机械制造专业英语教材以及部分科技英语翻译技巧方面的教材和著作，在此谨向这些教材和著作的编者表示感谢。

由于编者水平有限，恳请读者对本书的缺点和错误提出批评指正。

编　者

2000年8月于长沙岳麓山

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第一篇

科技英语翻译和阅读材料

Charpter One Materials and Mechanical Elements

Lesson 1 Introduction for Materials

Designers and engineers are usually more interested in the behavior of materials under load or when in a magnetic field than in why they behave as they do. Yet the better one understands the nature of materials and the reasons for their physical and mechanical properties the more quickly and wisely will he/she be able to choose the proper material for a given design. Generally, a material property is the measured magnitude of its response to a standard test performed according to a standard procedure in a given environment①. In engineering materials the loads are mechanical or physical in nature and the properties are recorded in handbooks or, for new materials, are made available by the supplier. Frequently such information is tabulated for room-temperature conditions only, so when the actual service conditions are at subfreezing or elevated temperatures, more information is needed.

The properties of materials are sometimes referred to as structure sensitive, as compared to structure – insensitive properties. In this case structure-insensitive properties include the traditional physical properties: electrical and thermal conductivity, specific heat, density, and magnetic and optical properties. The structure-sensitive properties include the tensile and yield strength, hardness, and impact, creep, and fatigue resistance. It is recognized that some sources maintain that hardness is not a true mechanical property, because it varies somewhat with the characteristics of the indentor and therefore is a technological test. It is well known that other mechanical properties vary significantly with rate of loading, temperature, geometry of notch in impact testing, and the size and geometry of the test specimen. In that sense all mechanical tests of material properties are technological tests. Furthermore, since reported test values of materials properties are statistical averages, a commercial material frequently has a tolerance band of ±5 percent or more deviation from a given published value.

In the solid state, materials can be classified as metals, polymers, ceramics, and composites. Any particular material can be described by its behavior when subjected to external conditions. Thus, when it is loaded under known conditions of direction, magnitude, rate, and environment, the resulting responses are called mechanical properties. There are many possible complex interrelationships among the internal structure of a material and its service performance. Mechanical properties such as yield strength, impact strength, hardness, creep, and fatigue resistance are strongly structure-sensitive, i. e., they depend upon the arrangement of the atoms in the crystal lattice and on any imperfections in that arrangement, whereas the physical properties are less strucure-sensitive② . These include electrical, thermal, magnetic, and optical properties and do depend in part upon structure; for example, the resistivity of a metal increases with the amount of cold work. Physical properties depend primarily upon the relative excess or deficiency of the electrons that establish structural bonds and upon their availability and mobility. Between the conductors with high electron mobility and the insulators with no free electrons, precise control of the atomic architecture has created semiconductors that can have a planned modification of their electron mobility. Similarly, advances in solid-state optics have led to the development of the stimulated emission of electromagnetic energy in the microwave spectrum (masers) and in the visible spectrum(lasers)③.

In studying the general structure of materials, one may consider three groupings: first, atomic structure, electronic configuration, bonding forces, and the arrangement of the aggregations of atoms; second, the physical aspect of materials, including properties such as electrical and thermal conductivity, specific heat, and magnetism; and third, their macroscopic properties, such as their mechanical behavior under load, which can be explained in terms of impurities and imperfections in the lattice structure and the procedures used to modify that behavior.

New Words

tabulate ['tæbjuleit] v. 把…制成表,列表显示
subfreezing 冰点以下的
tensile['tensail] a. 张力的,拉力的
impact['impækt] n. 冲击,碰撞;回弹
creep [kri:p] n. 蠕变,滑移
notch [nɔtʃ] n. 槽口,凹口
tolerance ['tɔlərəns] n. 公差,偏差
polymer['pɔlimə] n. 聚合物、高聚物
ceramic[si'ræmik] a. 陶瓷的,陶器的
composite['kɔmpəzit] n. 复合材料,组合
interrelationship n. 相互关系,内在关系
lattice['lætis] n. 晶格;网络;承重结构
imperfection[impə'fekʃən] n. 缺陷,不足,不完整性
resistivity[ri:zis'tiviti] n. 抵抗力,稳定性;电阻率,比(电)阻
deficiency[di'fiʃənsi] n. 缺乏,不足;缺陷
mobility[mou'biliti] n. 灵活性,迁移率,活动性
spectrum ['spektrəm] n. 频谱,范围,领域
insulator['insjuleitə] n. 绝缘体,绝热体
modification[mɔdifi'keiʃən] n. 改变,限制
configuration[kənfigju'reiʃən] n. 结构;排列;轮廓,图形
aggregation[ægri'geiʃən] n. 聚集,群集
macroscopic[mækrou'skɔpik] a. 宏观的
impurity [im'pjuəriti] n. 杂质,夹杂
imperfection [impə'fekʃən] n. 不完全,缺陷

Phrases and Expressions

behave as 起…作用,相当于,性能[作用]像一样
in nature 实质上,事实上
elevated temperature 高温
(be)referred to as 叫做,称为,被认为是
structure-sensitive 结构敏感性
physical property 物性,物理性能
yield strength 屈服强度
fatigue resistance 抗疲劳性
solid state 固态
subject to 经受,受到
crystal lattice 晶格,晶体点阵
crystal structure 晶体结构
impact strengt 冲击韧性,冲击强度
in part 部分地,有几分
cold work 冷加工,冷作,冷变形
be classified as 分成…类
service conditions 使用情况,操作条件
service performance 使用性能
stimulated emission 受激发射
mechanical behavior 机械性能,机械特性

Notes

1. Generally, a material property is … in a given environment.

通常，材料性能是在给定的环境条件下按照规定的方法进行的标准试验所获得的测定值。

according to … 和 in a given environment 是作定语的 performed 所带的状语。

2. Mechanical properties such as yield strength, … are less structure-sensitive.

屈服强度，冲击韧性，硬度、抗蠕变性能及抗疲劳强度等机械性能的结构敏感性较强，即它们取决于晶格中原子的排列及排列中的缺陷，而物理性能的结构敏感性较小。

3. maser = microwave amplification by stimulated emission of radiation 微波激射。

Free Reading

1 Physical Properties of Materials

In the selection of materials for industrial applications, many engineers normally refer to their average macroscopic properties, as determined by engineering tests, and are seldom concerned with microscopic considerations. Others, because of their specialty or the nature of their positions, have to deal with microscopic properties.

The average properties of materials are those involving matter in bulk with its flaws, variations in composition, and variations in density that are causd by manufacturing fluctuations. Microscopic properties pertain to atoms, molecules, and their interactions. These aspects of materials are studied for their direct applicability to industrial problems and also so that possible properties in the development of new materials can be estimated.

In order not to become confused by apparently contradictory concepts when dealing with the relationships between the microscopic aspects of matter and the average properties of materials, it is wise to consider the principles that account for the nature of matter at the different levels of our awareness. These levels are the commonplace, the extremely small, and the extremely large. The commonplace level deals with the average properties already mentioned, and the principles involved are those set forth by classical physics. The realm of the extremely small is largely explained by means of quantum mechanics, whereas that of the extremely large is dealt with by relativity.

Relativity is concerned with very large masses, such as planets or stars, and large velocities that may approach the velocity of light. It is also applicable to smaller masses, ranging down to subatomic particles, when they move at high velocities. Relativity has a definite place in the tool boxes of nuclear engineers and electrical engineers who deal with particle accelerators. For production engineers, relativity is of only academic interest and is mentioned here for the sake of completeness.

2 Mechanical Properties of Materials

Once the important physical properties of a material have been established, mechanical properties such as yield strength and hardness must be considered. Mechanical properties are structure-sensitive in the sense that they depend upon the type of crystal structure and its bonding forces, and especially upon the nature and behavior of the imperfections that exist within the crystal itself or at the grain boundaries.

An important characteristic that distinguishes metals from other materials is their ductility and ability to be deformed plastically without loss in strength. In design, 5 to 15 percent elongation provides the capacity to withstand sudden dynamic overloads. In order to accommodate such loads without failure, materials need dynamic toughness, high moduli of elasticity, and the ability to dissipate energy by substantial plastic deformation prior to fracture.

To predict the behavior of a material under load, engineers require reliable data on the mechanical properties of materials. Handbook data is available for the average properties of common alloys at 68°F. In design, the most frequently needed data are tensile yield strength, hardness, modulus of elasticity, and yield strengths at temperatures other than 68°F. Designers less frequently use resistance to creep, notch sensitivity, impact strength, and fatigue strength. Suppliers' catalogs frequently give more recent or complete data.

Production-engineering data that is seldom found in handbooks include strength-to-weight ratios, cost per unit volume, and resistance to specific service environments.

A brief review of the major mechanical properties and their significance to design is included to ensure that the reader is familiar with the important aspects of each test.

3 Selecting Materials

An ever-increasing variety of materials is available, each having its own characteristics, applications, advantages, and limitations. The following are the general types of materials used in manufacturing today:

- Irons and steels (carbon, alloy, stainless, and tool and die steels).
- Nonferrous metals and alloys (aluminum, magnesium, copper, nickel, titanium, superalloys, refractory metals, beryllium, zirconium, low-melting alloys, and precious metals).
- Plastics (thermoplastics, thermosets, and elastomers).
- Ceramics, glass ceramics, glasses, graphite, and diamond.
- Composite materials (reinforced plastics, metal-matrix and ceramic-matrix composites, and honeycomb structures).

1) Properties of materials

When selecting materials for products, we first consider their mechnical properties: strength, toughness, ductility, hardness, elasticity, fatigue, and creep. The strength-to-weight and stiffness-to-weight ratios of material are also important, particularly for aerospace and automotive applications. Aluminum, titanium, and reinforced plastics, for example, have higher ratios than steels and cast irons. The mechanical properties specified for a product and its components should of course be for the conditions under which the product is expected to function. We then consider the physical properties of density, specific heat, thermal expansion and conductivity, melting point, and electrical and magnetic properties.

Chemical properties also play a significant role in hostile as well as normal environments. Oxidation, corrosion, general degradation of properties, toxicity, and flammability of materials are among the important factors to be considered. In some commercial airline disasters, for example, many deaths have been caused by toxic fumes from burning nonmetallic materials in the aircraft cabin.

Manufacturing properties of materials determine whether they can be cast formed, machined, welded, and heat treated with relative ease. The method(s) used to process materials to the desired shapes can adversely affect the product's final properties and service life.

2) Availability and cost

Availability and cost of raw and processed materials and manufactrued components are major concerns in manufacturing. Competitively, the economic aspects of material selection are as important as the technological considerations of properties and characteristics of materials.

If raw or processed materials or manufactured components are not available in the desired quantities, shapes, and dimensions, substitutes and/or additional processing will be required, which can contribute significantly to product cost. For example, if we need a round bar of a certain diameter and it is not available in standard form, then we have to purchase a larger rod and reduce its diameter by some means, such as machining, drawing through a die, or grinding.

Reliability of supply, as well as demand, affects cost. Most countries import numerous raw materials that are essential for production. Note the reliance of the United States on imported raw materials. The broad political implications of such reliance on other countries is self-evident.

Different costs are involved in processing materials by different methods. Some methods require expensive machinery, others require extensive labor, and still others require personnel with special skills or a high level of education or specialized training.

3) Appearance, service life, and disposal

The appearance of materials after they have been manufactured into products influences their appeal to the consumer. Color, feel, and surface texture are characteristics that we all consider when making a decision about purchasing a product.

Time and service-dependent phenomena such as wear, fatigue, creep, and dimensional stability are important. These phenomena can significantly affecct a product's performance and, if not controlled, can lead to total failure of the product.

Similarly, compatibility of materials used in a product is important. Friction and wear, corrosion, and other phenomena can shorten a product's life or cause it to fail. An example is galvanic action between mating parts made of dissimilar metals, which corrodes the parts.

Recycling or proper disposal of materials at the end of their useful service lives has become increasingly important in an age conscious of maintaining a clean and healthy environment. Note, for example, the use of biodegradable packaging matrials or recyclable glass bottles and aluminum beverage cans. The proper disposal of toxic wastes and materials is also a crucial consideration.

Lesson 2 Steels

Steel is one of the most valuable metals known to man; approximately 200 million tons can be produced in the United States annually. In 1900, US capacity was but 21 million tons. Although the process of steelmaking is familar to most engineers, a review of this process would be appropriate at this time.

Iron ore, limestone, and coal are the principal raw materials used in making iron and steel. Coke is produced by heating bituminous coal in special ovens. Skip cars go up the skip hoist with loads of iron ore, coke, and limestone and dump them into the top of the blast furnace. Hot air from the stove is blown into the furnace near the bottom. This causes the coke to burn at temperatures up to 3 000°F. The ore is changed into drops of molten iron that settle to the bottom of the blast furnace. The limestone that has been added joins with impurities to form a slag that floats on top of the pool of liquid iron. Periodically (approximately every 6 hours), the molten iron is drained into a ladle for transporting to either the Bessemer converter, electric furnace or open-hearth furnace. The slag is removed separately so as not to contaminate the iron.

The making of steel from iron involves a further removal of impurities. Regardless of which process is used for making steel-open-hearth, Bessemer-converter, or electric-furnace-steel scrap is added along with desired alloying elements and the impurities are burned out.

Liquid steel removed from the furnace is poured into ingot molds. The ingots are then removed to "soaking pits" where they are brought to a uniform rolling temperature.

At the rolling mill, the white-hot steel passes through rolls that form the plastic steel into the desired shape: blooms, slabs, or billets. These three semifinished shapes then go to the finishing mills where they are rolled into finished forms as structural steel, plates and sheets, rods, and pipes.

Steel is the basic and most valuable material used in apparatus manufactured today. Its application is based on years of engineering experience, which serves as a guide in choosing a particular type of steel. Each variable, such as alloy, heat treatment, and processes of fabrication (casting, forging, and welding) has its influence on the strength, ductility, machinability, and other mechanical properties, and affects the type of steel selected. The following basic concepts also assist in determining which steel should be used:

1. The modulus of elasticity in tension falls within the range of 28×10^6 to 30×10^6 lb/in^2., regardless of composition or form; therefore, sizes as determined by deflection remain the same regardless of the steel chosen①.

2. Carbon content determines the maximum hardness of steel regardless of alloy content. Therefore, the strength desired, which is proportional to hardness, can determine the carbon content.

3. The ability of the steel to be uniformly hardened throughout its volume depends on the amount and kind of alloy. This is more complex, but does not necessarily change the calculation of the size of the part.

4. Ductility decreases as hardness increases.

The preliminary choice of steel for a part as well as for other factors, such as notch sensitivity, shrinkage, blowholes, corrosion, and wear, is simplified when based on the above principles. The final selection is made by matching the material with the process of manufacture used in order to obtain the shape, surface, and physical requirements of the part. The selection may be made from among low-carbon steels, low-alloy steels, high-carbon steels, and high-alloy steels.

Steel is one of the few common metals that has an endurance limit. You will recall that fatigue is the failure of a material due to repeated loading. Most metals become tired as they are subjected to stress over and over again. The stress a material can withstand under constant loading is much less than under static loading. As steel is continually loaded, it will reach a lower limit of strength. This property is quite pronounced in wire shapes. Common copper and aluminum wire can easily be broken by flexing the wire in a local spot. Normally after a few dozen flexes, the wire breaks. Steel wire, however, is very tough and flexing the wire simply cold works the material making the process futile for the unknowing person trying to break a steel wire. At some point steel will resist weakening due to repeated loading. This is known as an "endurance limit". The endurance limit of steel is around 60% of its original strength.

This property of having an endurance limit makes steel invaluable for use in structural applications like bridges, springs, struts, beams, etc. Of course, there are many factors that effect the endurance limit of a material. A primary factor is the surface quality of the material and/or the manufacturing process used to produce the specimen.

Fatigue is attributable to the initial material not being an ideal homogeneous solid. In each half cycle, irreversible minute strains are produced. Fatigue failure usually develops from:

1. Repeated cyclic stresses that cause incremental slip and cold working locally in the material.

2. Gradual reduction of ductility of the strain hardened areas that develop into cracks.

3. A notching effect from submicroscopic cracks.

The endurance limits of steels create some very desirable physical properties. These properties can be detrimental to the manufacturability of the material. For instance, in the cold rolling of steel the endurance limit creates a limitation on the amount of cold working that can be imput to any part[2]. After this limit has been reached the material must be heated above its critical temperature to permit further cold working.

New Words

steelmaking n.炼钢

bituminous [bi'tju:minəs] a.含沥青的,

slag [slæg] n.炉渣,轧屑,渣孔

coke [kouk] n.焦炭;vt.炼焦

limestone n.石灰石,灰石

ladle ['leidl] n.铸勺,铁水包,渣包

contaminate [kən'tæmineit] vt.污染,弄脏,损害

scrap [skræp] n.废料,切屑;废品,

ingot ['iŋgət] n.钢坯,铸锭,铸模

bloom [blu:m] n.大钢坯,钢锭;茂盛时期

slab [slæb] n.初轧板坯,板料,厚板

billet ['bilit] n.钢坯,棒料;字条

fabrication [fæbri'keiʃən] n.制造,装配;虚构

ductility [dʌk'tiliti] n.延展性,可锻性

modulus ['mɔdjuləs] n.模数,系数;模件。

shrinkage ['ʃriŋkidʒ] n.收缩率,缩减,下沉

blowhole ['blouhoul] n.气孔,砂眼,气泡

invaluable [in'væljuəbl] a.无价的,非常宝贵的,无法估价的

strut [strʌt] n.短柱,压杆,撑条;v.支撑

homogeneous [hɔmə'dʒi:njəs] a.同类的,相似的,结构相同的

irreversible [iri'və:səbl] a.不可逆转的,不能倒置的

submicroscopic ['sʌbmaikrə'skɔpik] a.亚微观的,亚显微结构的

detrimental [detri'mentl] a.有害的,不利的

Phrases and Expressions

be familar to 为…所熟悉
a review of 考察,研究,看看
bituminous coal 烟煤
skip car 翻斗车,上料车
skip hoist 料车绞车、箕斗提升机
blast furnace 高炉,鼓风炉
Bessemer converter 酸性转炉
open-hearth furnace 平炉
alloying element 合金元素
soaking pit 均热炉,浸池
finishing mill 精轧机
notch sensitivity 切口敏感性
alloy steel 合金钢
carbon steel 碳钢
static loading 静载荷
endurance limit 疲劳极限
cyclic stress 交变应力
attributable to 可归因于…的
fatigue failure 疲劳断裂,疲劳失效
critical temperature 临界温度

Notes

1. The modulus of elasticity in tension … the same regardless of the steel chosen.

无论钢的成分与结构形状如何,其拉伸弹性模量均在 28×10^6 至 $30 \times 10^6 lb/in^2$ 之间,因此,由变形所确定的结构尺寸都是相同的,而与所选择的钢无关。

regardless of … 与…无关

2. For instance, in the cold rolling of steel …that can be imput to any part.

例如,在钢的冷轧过程中,其疲劳极限会限制对零件施加的冷作加工量。

Free Reading

1 Carbon Steel

Plain carbon steels represent the major proportion of steel production. Carbon steels have a wide diversity of application, including castings, forgings, tubular products, plates, sheets and strips, wire and wire products, structural shapes, bars, and tools. Plain carbon steels, generally, are classified in accordance with their method of manufacture as basic open hearth, acid open hearth, or acid Bessemer steels, and by carbon content.

The principal factors affecting the properties of the plain carbon steels are the carbon content and the microstructure. The microstructure is determined by the composition of the steel (carbon, manganese, silicon, phosphorus, and sulfur, which are always present, and residual elements including oxygen, hydrogen, and nitrogen) and by the final rolling, forging , or heat-treating operation. However, most of the plain carbon steels are used without a final heat treatment and, consequently, the rolling and forging operations influence the microstructure.

Carbon steels are predominantly pearlitic in the cast, rolled, or forged conditions. The constituents of the hypoeutectoid steels are therefore ferrite and pearlite, and of the hypereutectoid steels are cementite and pearlite.

2 Alloy Steel

Alloy steel is an alloy of iron and carbon containing alloying elements, one or more of which exceeds