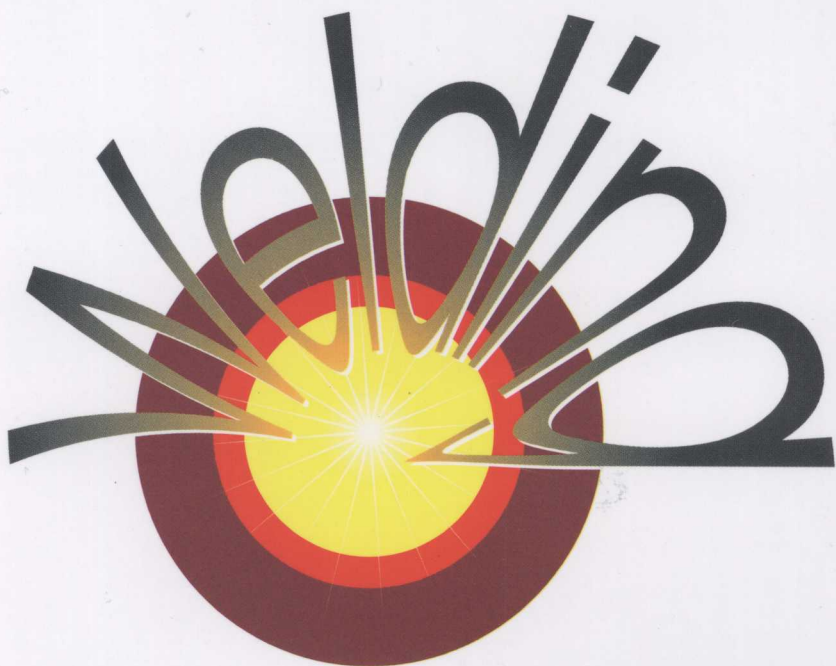




职业教育“十一五”规划教材
焊接专业“双证制”教学改革用书

焊接专业英语

赵丽玲 主编



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教育部“双证书”教材

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机械工业出版社

本书共分5个单元,包括课文和阅读材料共36篇,主要介绍焊接技术的基本知识,焊接应力与裂纹产生的原因及防止办法,常用的焊接方法、切割方法、无损探伤方法的原理、特点及其在工业中的应用等。本书形式新颖,内容全面,难度适中,对重要的知识点全部进行了解释。此外,书后还附有常用的焊接专业词汇及本书词汇,以便于学生自学。

本书可作为职业教育焊接专业教材,也可供从事焊接专业的工程技术人员和管理人员参考。

为便于教学,本书配备了电子教案和全部译文,选择本书作为教材的教师可来电索取(010-88379182),或登录 www.cmpedu.com 网站注册免费下载。

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前言

为了进一步贯彻《国务院关于大力推进职业教育改革与发展的决定》的文件精神,加强职业教育的教材建设,满足职业院校深化教学改革对教材建设的要求,机械工业出版社于2006年11月在北京召开了“职业教育焊接专业教材建设研讨会”。在会上,来自全国十多所院校的焊接专业专家和一线骨干教师研讨了新的职业教育形势下焊接专业的课程体系,确定了面向中职、高职层次两个系列教材的编写计划。本书就是根据会议所确定的教学大纲和高等职业教育培养目标组织编写的。

本教材共分为焊接基础知识、焊接应力与裂纹、焊接方法、切割和无损探伤5个单元。每个单元由若干个知识模块组成,每个知识模块包括课文、单词、短语、注释、阅读材料等。为了加强学生对课文内容的理解,在课文中插入了若干个小问题、小知识,并且在注释中对一些重要的知识点进行了解释。

本教材的编写尽量做到与焊接专业知识紧密结合,突出应用性和实践性,所选文章简单易懂,先易后难,由浅入深,知识的覆盖面广,使学生掌握焊接专业词汇,学习科技英语的翻译技巧,从而提高学生的英语阅读能力。

参加本书编写的有赵丽玲、吴志亚、赵颖、张楠。其中第一、二单元和附录由赵丽玲编写,第三单元由吴志亚、赵颖共同完成,第四单元由吴志亚编写,第五单元由张楠编写。全书由赵丽玲统稿,沈阳工业大学的陈立佳教授主审。

为便于教学,本书配备了电子教案和全部译文,选择本书作为教材的教师可来电索取(010-88379182),或登录 www.cmpedu.com 网站注册免费下载。

由于编者水平有限,加之时间仓促,教材难免有不足之处,甚至出现错误,恳请广大读者批评指正。

编者

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Unit One Basic Knowledge of Welding

学习目标：本单元介绍焊接的定义及焊接的基础知识。通过本单元的学习，使学生了解与焊接相关的一些基本知识，掌握相关的专业词汇，提高学生阅读、理解科技英语的能力。

Module 1 What Is Welding

Text

Welding techniques have become so **versatile** that it is difficult **nowadays** to **define** “welding.” **Formerly** welding was “the joining of metals by **fusion**,” that is, by **melting**, but this **definition** will **no longer** do^①. **Even though** fusion methods are still the most common, they are not always used. Welding was next **defined as** the “joining of metals by heat,” but this is no longer a proper definition either. Not only metals can be welded, so can many of the plastics^②. **Furthermore**, several welding methods do not require heat, such as **cold pressure welding**. Besides, we can weld with sound and even with light from the famous **laser**. **Faced with a diversity** of welding methods that increase year by year, we must adopt the following definition of welding: “welding is the joining of metals and **plastics** by methods that do not employ fastening devices.”^③

The joining of metals by methods that do not employ fastening devices is an art as



What's welding?





old as blacksmithing^④. Nevertheless welding as a **manufacturing** process must be considered a development of the twentieth century. In the 1880's **carbon arc** lamps were used for street lighting^⑤. At that time it was noted that the carbon arc lamp, like all lamps, produced more heat than light, and the first attempts were made to use this heat for welding metals. Thus the first welding method of those still in use was **carbon arc welding**, perfected about the turn of the last century^⑥. Stick **electrodes** and **oxyacetylene welding** also appeared about 1900. Welding was generally used only for repair and **maintenance** until the 1920's. **X-ray examination** of welds came soon afterward and did much to develop **confidence** in welded joints. The middle of the 20th century saw great development in welding as well as in other techniques. It also gave

True or False?



At the beginning of the 20th century, welding was broadly applied in the industry.

us, among other things, **inert gas welding**. Since then welding has progressed at a **tremendous** rate. It helps develop science and technology,

including the **electronic** technique. *At the same time*, the technology of welding **embraces** a wide area. Many electronic circuits are required to control the more **intricate** welding machines. Even **radio frequencies** have their applications in welding, in **induction brazing** and the **ultrasonic testing** of welds. **Photography is** also **drawn into** the **scope** of welding for X-ray and γ -ray photography is used in the examination of welded joints^⑦. Welding has

made important contributions to the modernization of our national defence industry, such



Why shall we say that the welding technology embraces a wide area?

as the making of **nuclear** reactors and manmade earth satellites, for both are **weldments**. *On the other side of the coin*, those products of the nuclear reactors, **radioisotope**, are familiar around **welding shops** in their function of weld testing. All these and other developments show that welding is no longer what it was in time past, the simple matter of running a **bead** with a gas **flame** or a stick electrode^⑧.

The operator of the modern automatic welder wears neither welding **helmet** nor



goggles when welding the **heavy-walled pressure vessel**. But **depositing** weld metal is about fifteen times faster than by manual methods. His welding rods are the two larger coils of wire at the top of the welding machine, and these are automatically fed into the



What characteristics does the submerged arc welding have?

weld. The arc is not visible in this method of welding, and so no helmet is required. The welding controls are grouped on the control **panel** to the

immediate right of the operator. This is the **submerged arc welding**, a commonly used welding method that can in an hour deposit weld metal equal in weight to that of the operator himself^⑨. At the opposite extreme is **microwelding**, in which the operator may need a microscope to see what he has welded. Between these two extremes in size and welding capacity are perhaps five dozen other welding methods^⑩.

New Words

weld	/weld/	vt. 焊接 n. 焊接, 焊缝
versatile	/'vɜ:sə'tail/	adj. 多方面的
nowadays	/'naʊədeiz/	adj. 现在, 现今
define	/di'fain/	vt. 给……下定义
formerly	/'fɔ:məli/	adj. 以前
fusion	/'fju:ʒn/	n. 熔化, 熔合
melt	/melt/	v. 熔化
definition	/defi'niʃən/	n. 定义
furthermore	/'fə:ðə'mɔ: /	adj. 而且, 此外
laser	/'leizə/	n. 激光, 激光器
diversity	/dai'vɜ:səti/	n. 多样性, 变化
plastics	/'plæstiks/	pl. 塑料, 塑料制品
nevertheless	/,nevəðə'les/	adj. 尽管如此, 仍然
manufacture	/mænju'fæktʃə/	vt. 制造
carbon	/'kɑ:bən/	n. 碳
arc	/ɑ:k/	n. 电弧



electrode	/i'lekt'rəud/	n. 焊条, 电极
oxyacetylene	/'ɒksi-ə'setili:n/	n. 氧乙炔
maintenance	/'meintinəns/	n. 维修, 保养
confidence	/'kɒnfɪdəns/	n. 信任, 信心
inert	/'i'nɜ:t/	adj. 惰性的
tremendous	/tri'mendəs/	adj. 巨大的, 极大的
electronic	/ilek'trɒnik/	adj. 电子的
embrace	/im'breis/	vt. 包括, 包含
intricate	/'intrikət/	adj. 复杂的
frequency	/'fri:kwənsi/	n. 频率
brazing	/breiziŋ/	n. 硬钎焊
ultrasonic	/ʌltʃə'sɒnik/	adj. 超声波的
photography	/fə'tɒgrəfi/	n. 摄影术
scope	/skəup/	n. 范围
nuclear	/'nju:kliə/	adj. 原子核的
weldment	/'weldmənt/	n. 焊件
radioisotope	/,reidiəu'aɪsətəup/	n. 放射性同位素
bead	/bi:d/	n. 焊道
flame	/fleim/	n. 火焰
helmet	/'helmit/	n. 面罩
goggle	/'gɒgl/	n. 护目镜
deposit	/di'pɒzɪt/	v. 熔敷
panel	/'pænl/	n. 仪表盘
submerge	/səb'mə:dʒ/	v. 浸没, 淹没
microwelding	/'maɪkrə'weldɪŋ/	n. 显微焊

Phrases

no longer	不再
even though	虽然, 即使
define... as...	把……定义为……



cold pressure welding	冷压焊
faced with	面临
carbon arc welding	碳弧焊
oxyacetylene welding	氧乙炔焊
X-ray examination	X 射线检验
inert gas welding	惰性气体保护焊
at the same time	同时
radio frequency	高频, 射频
induction brazing	感应钎焊
ultrasonic testing	超声波探伤
be drawn into	被引进
on the other side of the coin	另一方面
welding shop	焊接车间
heavy-walled	厚壁的
pressure vessel	压力容器
submerged arc welding	埋弧焊

Notes

① Formerly welding was “the joining of metals by fusion,” that is, by melting, but this definition will no longer do.

以前, 焊接是指“通过熔化连接金属”, 但这个定义不再合适了。

句中“that is, by melting”是对前一句“the joining of metals by fusion”的解释说明; 动词“do”在本句中是不及物动词, 可译作“合适, 适用”。

② Not only metals can be welded, so can many of the plastics.

不仅金属能被焊接, 而且许多塑料也可以被焊接。

句中“so can many of the plastics”等于“but also many of the plastics can be welded”, 在本句中的意思为“许多塑料也是如此”, 即“许多塑料也可以被焊接”。



焊接不仅可以作为金属的连接方式，它还可以用于非金属如石墨、陶瓷、玻璃、塑料等的连接，也可以连接一种金属与一种非金属。

③ Faced with a diversity of welding methods that increase year by year, we must adopt the following definition of welding: “welding is the joining of metals and plastics by methods that do not employ fastening devices.”

面对逐年增加的各种各样的焊接方法，我们有必要采用下面的焊接定义：“焊接是不用紧固装置而连接金属和塑料的方法。”

句中“that increase year by year”是定语从句，修饰前面的“welding methods”；“that do not employ fastening devices”也是定语从句，修饰前面的“methods”。

④ The joining of metals by methods that do not employ fastening devices is an art as old as blacksmithing.

不需要紧固装置的金属连接方式是和打铁术一样古老的艺术。

句中“that do not employ fastening devices”是定语从句，修饰前面的“methods”；“as old as...”译作“像……一样古老的”；“blacksmithing”可译为“打铁术”。



资料卡

焊接是一门古老而又年轻的加工方法，远在我国古代就有使用锻焊和钎焊的实例，如在著称世界的秦始皇陵中出土的铜车马上就发现了钎焊的焊缝。明代的科学著作《天工开物》上就有关于锻焊的记载：“凡铁性逐节粘合，涂以黄泥于接口之上，入火挥槌，泥滓成枵而去，取其神气为媒合，胶合之后，非灼红斧斩永不可断也。”

但是目前工业生产中广泛应用的焊接技术，却是19世纪末20世纪初现代科学技术发展的产物。

⑤ In the 1880's carbon arc lamps were used for street lighting.

在19世纪80年代碳弧灯被用于街道照明。

句中“the 1880's”有时写作“the 1880s”，是指“19世纪80年代。”



⑥ Thus the first welding method of those still in use was carbon arc welding, perfected about the turn of the last century.

因此,目前正在使用的焊接方法中最早出现的是碳弧焊,它在上世纪初得到了完善。

句中“still in use”为介词短语做定语,修饰前面的“those”;本句用“those”代替了“welding methods”;“the turn of the last century”表示“上个世纪开始时”的含义。

⑦ Photography is also drawn into the scope of welding for X-ray and γ -ray photography is used in the examination of welded joints.

摄影技术也被引进焊接领域,因为X射线和 γ 射线照相技术被应用于焊接接头的质量检验。

句中“for”相当于“because”,表示“因为,由于”的含义。

⑧ All these and other developments show that welding is no longer what it was in time past, the simple matter of running a bead with a gas flame or a stick electrode.

所有这些和其他的新技术都显示焊接不再是过去那样,只用气体火焰或一根焊条焊一道焊缝的简单问题了。

句中“that”引导的是宾语从句,作“show”的宾语;“what”引导的是表语从句;“the simple matter of running a bead with a gas flame or a stick electrode”为“what”引导的表语从句的同位语。

⑨ This is the submerged arc welding, a commonly used welding method that can in an hour deposit weld metal equal in weight to that of the operator himself.

这是埋弧焊,一种常用的焊接方法,它在一小时内熔敷的金属量可以等于操作者本身的重量。

句中“a commonly used welding method that can in an hour deposit weld metal equal in weight to that of the operator himself”是“the submerged arc welding”的同位语;其中“that can in an hour deposit weld metal equal in weight to that of the operator himself”是定语从句,修饰前面的“welding method”。

⑩ Between these two extremes in size and welding capacity are perhaps five dozen other welding methods.

大约有60多种其他的焊接方法介于这两种规模和焊接能力之间。



此句为倒装句，主语为“five dozen other welding methods”，谓语动词为“are”。

Reading Material

Classification of Welding Processes

Most **welding processes** (焊接方法) require the application of energy (heat or pressure) to produce a suitable **bond** (连接). Therefore welding processes may be classified and named **according to** (根据) by the type of energy source **employed** (使用). If including brazing, the classification of welding processes is listed below:

(1) **Fusion welding** (熔焊)

① **Oxyacetylene welding** (OAW) (氧乙炔焊)

② **Arc Welding** (电弧焊)

Shielded metal arc welding (SMAW) or **Manual metal arc welding** (MMAW) (焊条电弧焊)

Gas metal arc welding (GMAW) (熔化极气体保护电弧焊), includes: **metal inert gases arc welding** (MIG) (熔化极惰性气体保护电弧焊) and **metal active gases arc welding** (MAG) (活性气体保护电弧焊)

Gas tungsten arc welding (GTAW) or **tungsten inert gas arc welding** (TIG) (钨极惰性气体保护电弧焊)

Flux cored arc welding (FCAW) (药芯焊丝电弧焊)

Electrode gas welding (GMAW-EG; FCAW-EG) (气电焊)

Plasma arc welding (PAW) (等离子弧焊)

Submerged arc welding (SAW) (埋弧焊)

③ **Electroslag welding** (ESW) (电渣焊)

④ **Thermit welding** (TW) (热剂焊)

⑤ **Laser beam welding** (LBW) (激光束焊)

⑥ **Electron beam welding** (EBW) (电子束焊)

(2) **Pressure welding** (压焊) (resistance welding (电阻焊))

① **Spot welding** (点焊)



- ② *Seam welding* (缝焊)
- ③ *Butt welding* (对焊)
- ④ *Cold pressure welding* (冷压焊)
- ⑤ *Friction welding* (摩擦焊)
- ⑥ *Ultrasonic welding* (超声波焊)
- ⑦ *Explosion welding in vacuum* (真空爆炸焊)
- ⑧ *Diffusion welding* (扩散焊)
- ⑨ *High frequency welding* (高频焊)
- (3) *Brazing welding* (钎焊)

This way of classifying welding processes is called **family-tree** (家谱) method.

In fact, there is no uniform method of naming welding processes. Many processes are named according to the heat source or shielding method, but certain **specialized** (特殊的) processes are **named after** (以……命名) the type of joint produced. Examples are **stud** (螺柱), spot and butt welding. An **overall** (全部的) classification cannot **take account of** (考虑) this because the same type of joint may be produced by a variety of processes. *Stud welding* (螺柱焊) may be done by arc or **projection welding** (凸焊) and spot welding by electric resistance, arc or electron-beam processes^①. Butt welding may be done by resistance, **flash** (闪光) or any of **a number of** (一种) other methods. Although in common usage many processes have **abbreviated** (缩写) names, the full names often follow the pattern: first, a statement of the type of shielding; secondly, the type of heat or energy source; thirdly, the type of joint (where this is of specific and not general importance).

It is often necessary when referring to processes to mention the way they are used, particularly whether the operation is manual or automatic^②. The practical operation of welding can be **divided into** (把……分为……) three main parts:

(a) The control of welding conditions, particularly arc length and electrode or filler-wire feed rate and time.

(b) The movement and guiding of the electrode, **torch** (焊炬) or **welding head** (焊接机头) along the weld line.

(c) The transfer or presentation of parts for welding.



Processes are described as manual, semi-automatic, or automatic, depending on the extent to which the parts mentioned above are performed manually. Manual welding is understood to be that in which the **welding variables** (焊接参数) are continuously controlled by the operator and the means for welding are held in the operator's hand^①. Semi-automatic welding is that in which there is automatic control of welding conditions such as arc length, rate of filler-wire addition and weld time, but the movement and guiding of the electrode, torch or welding head is done by hand. With automatic welding at least parts (a) and (b) of the operation must be done by the machine.

Notes

① Stud welding may be done by arc or projection welding and spot welding by electric resistance, arc or electron-beam processes.

螺柱焊可以采用电弧焊或凸焊进行焊接, 点焊可以采用电阻焊、电弧焊或电子束焊进行焊接。

句中“spot welding by electric resistance, arc or electron-beam processes”省略了谓语“may be done”。

② It is often necessary when referring to processes to mention the way they are used, particularly whether the operation is manual or automatic.

当谈及焊接方法时, 经常涉及所使用的方式, 尤其是采用手工操作还是自动操作。

句中“It”是形式主语, 真正的主语是不定式短语“to mention the way they are used”, 其中“they are used”是定语从句, 修饰“the way”; “when referring to processes”是状语从句, 也可放于句首。

③ Manual welding is understood to be that in which the welding variables are continuously controlled by the operator and the means for welding are held in the operator's hand.

手工焊可以被理解为焊接参数是由操作者连续控制的, 并且焊接方式也是由操作者手工控制的。

句中“which”代替前面的“Manual welding”, “in which”可译为“在手工焊中”。