# 科技英语选读

## Chemistry & Chemical Engineering · Materials · Applied Physics

### 化学与化工·材料·应用物理

主编：马翎

外文出版社

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# Readings in English for Science and Technology

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# 前　言

英语作为一门主流国际交流语言,其作用已日显重要。如何学好英语一直是人们关心的热点。近些年来,英语教学界基本认同了语言学习脱离不了文化这样一个道理。通过英语去更多地了解全球信息革命、科技突破、观念迭代、生活方式变更等已成为当今英语爱好者新的渴望和学习动力。

为适应英语学习这一新变化,许多新书已经面市,但是,总的来看,介绍社会生活方面的多,涉猎科技的少;而在科技读本中,内容综合的单本书多,按学科分类的丛书少。为了帮助大学四级以上英语水平的读者扩大知识面并能较系统地把握国外科技新进展,我们通过北京市高校研究生英语教学研究会组织了四所高等院校近二十位教师和专家编写了《科技英语选读》这套丛书。这套系列丛书共四卷,覆盖了十几门学科,如机电、化工、材料、信息、网络、生物技术、环境科学等。选材力求遵循新颖全面、理论与应用并重、旨趣性强三个原则。

**1. 新颖全面。**

入选文章既要突出学科最新成果和发展方向,又尽可能地反映该学科的全貌。《生物技术·环境科学》包括生物芯片、克隆和转基因动物、DNA 指纹分析等前沿性文章。同时,读者还能读到生物技术简史、人类基因组工程、农业生物技术等从不同侧面勾画生物技术的论述。《制造业·汽车技术》系统介绍机电一体化技术、虚拟制造、机器人等,汽车技术方面则选用了塑料汽车、电动汽车、模拟驾驶系统等文章。《化学与化工·材料·应用物理》让读者了解到纳米技术、航天材料、塑料电源等方面的知识,也较为全面地介绍了激光、超导、核动力等。《网络·通讯·计算机》选取网络安全、电子商务、虚拟现实、多媒体等方面的最新材料,同时还让读者了解到 Java 语言、浏览技

术、Intranet 等信息技术的发展动向。

**2. 理论与应用并重。**

丛书重点突出技术的实用性。理论性文章少而精，重点突出技术的应用。如 E-mail 的有效使用、网上商务、远程存取办公资料等，都直接面对信息社会的生活需要。在“生物技术”中，除五篇关键性理论介绍外，大部分都是应用方面的文章，如基因疗法、克隆技术、DNA 分析等。“环境科学”则着重介绍资源保护方面的现状和发展。

**3. 旨趣性强。**

为避免科技读物枯燥晦涩的弊病，丛书坚持了知识性与趣味性并重，所选文章读起来有益并且有趣。“制造业”中不仅选用了介绍机器人的文章，还包括了微观技术、军事侦察、三维动画等有趣的题目。“环境科学”涉及了太空开发动植物、生态旅游、野生动物保护等有趣的题材。《化学与化工·材料·应用物理》则收录了几篇具有探索性的小论文，如《利用 $CO_2$ 制造绿色塑料》、《植物回收重金属》。

由于读者已经具备一定的英语基础，本套丛书的练习便集中在专业词汇释义、难句、概念和背景的注释上。我们希望该套丛书能够帮助广大英语爱好者和科技爱好者更好、更快地阅读英语科技文章并能拓宽知识面，把握科技时代的脉搏，充满信心地迈向二十一世纪。

编　者

# Contents

# Part I

# Chemistry
# &
# Chemical Engineering

# 化学与化工

(1—14)

# 1. The Power of Plastic
# 塑料电源

Plastics are without doubt the most versatile and relied upon man-made materials in the world today. Their applications range from chairs and tables to computers and telephones, and they have all but① replaced metals in many industries. Now it seems that they are poised to② invade one of the last **strongholds** of the metals: the domain of the battery.

Despite their many desirable properties, plastics have always been dependent on metals as a source of power. Mobile phones, laptop computers, hand-held video games③—all have needed metal **compounds** to generate the electricity they need to work. Metals have many problems associated with them. Many of them, such as the **lithium** used in watch batteries, are very dangerous to work with. The manufacture of the batteries is not a task to be treated lightly. Most of them, such as **cadmium** in the Nicad rechargeable batteries④, are also highly **toxic**, and pose a serious problem in terms of environmentally friendly disposal. Of course, all these problems lead to an inevitable increase in the cost of manufacture, which must be met by the consumer.

Now it seems that a new alternative to these costly heavy metal systems is on the horizon⑤. Imagine instead a battery which could be made from totally **recyclable** plastics. A battery which **incorporates** only non-toxic materials, and so poses no danger to people. A battery which could be **moulded** to any desired shape or design; one which could be used as part of the body of a mobile phone or a computer.

The technology for such a battery is being worked on by Peter Searson and Ted Poehler at the Johns Hopkins campus in Maryland, Baltimore. Preliminary tests[6] seem to show that the plastic batteries can **outperform** their **metallic** counterparts in terms of how much energy they can store, the voltages they can produce, the temperatures they can operate at, and how often they can be recharged.

Batteries, or electrochemical cells, have been around for many years, and the principles of their operation have remained the same since their discovery. They consist of three parts: the **electrolyte** through which charged ions[7] move inside the cell to allow the chemical reaction to produce electricity, and two electrodes. One of these, the **anode**, is broken down during the reaction to produce the ions and electrons. The electrons travel out of the cell and into the wires of the system that is using the electricity. The other electrode, the **cathode**, takes in electrons from the system and recombines them with the ions released from the anode, thus completing the circuit. So far, the electrodes have nearly always been built from metals, since metals can easily and **reversibly** be broken down into the electrons and ions.

For the past 25 years or so, chemists have known about plastics which can conduct electricity[8]. They consist of long **polymer** chains, which have a long chain of interacting electrons running along their length. This itself does not conduct; it is like a road packed with cars bumper to bumper[9]—nobody can go anywhere. What can be done is to remove an electron from the chain, and so create a hole. Like removing one car from the traffic jam, this enables the electrons to move about, allowing electricity to flow.

In principle, therefore, it became possible to make electrodes out of plastic; by removing an electron from the chain, the plastic became conducting and able to receive an electron from outside, in the same way as a normal cathode. This is called p-type **doping**[10], because the loss of the electron from the chain gives it a positive (p) charge.

The problem came when people tried to make the plastic equivalent of an anode; this required the addition of an electron to the chain (n-type doping[11]), rather than the removal of one. Unfortunately, the plastics always became unstable when the electron was added. Nobody could find an n-type plastic which would work.

In the late summer of 1995, Searson and Poehler made an important discovery. They found that combining two types of plastic, polypyrrole and polystyrenesulphonate[12], gave a product which was stable when an electron was added. However, after doing tests on this material, which could be used as an anode in a battery, they discarded it. Two problems had arisen. the voltage produced by the new anode could not be raised above 1V; and the substance which was being used to supply the extra electron to the plastic was the dangerously reactive metal lithium.

But the discovery of this plastic had been a significant step forward. By the start of January 1996, Searson and Poehler had produced a new plastic, this time based on polythiophene[13]. Tests showed that this plastic could be used as an anode, to form a battery producing voltages much higher than the single volt of its predecessor. More importantly, the agent used to **dope** the plastic had been changed. No longer lithium, the team was now using a non-metallic material.

In July 1996, the world's first all-plastic battery was produced, using the new anode. Tests showed that it did indeed exceed many of the **specifications** of existing metallic batteries.

Exact details of the nature of the plastic, as well as the compound used to dope it with the extra electron, have not been revealed by the team since the technology has not yet been **patented**. In addition, the new battery is not without its problems. Calculations suggest that, although the battery is lighter, it does not store as much charge as some of the lithium based products available. There will probably be no weight advantage in using the plastic cell.

More importantly, the **prototype** loses charge at a rate of 2% per week if left standing around, compared to the 0.2% per week of the lithium battery. Though the inventors say that this will not be a problem for batteries which are in constant use, since they must be recharged regularly anyway, they are looking into the cause of the reduced storage efficiency to see what improvements can be made.

In the world of today, the implications are tremendous. Many battery manufacturers are lining up to take a look at the all-plastic design. Before long, the power of plastic could be upon us.

*Aldo Guiducci*

## NEW WORDS

anode /ˈænəud/ n. 阳极

cadmium /ˈkædmiəm/ n. 镉

cathode /ˈkæθəud/ n. 阴极

compound /ˈkɔmpaund/ n. 化合物

dope /dəup/ vt. 掺杂

doping /ˈdəupiŋ/ n. 掺杂
electrode /iˈlektrəud/ n. 电极
electrolyte /iˈlektrəulait/ n. 电解溶液
incorporate /inˈkɔːpəreit/ vt. 含有
lithium /ˈliθiəm/ n. 锂
metallic /miˈtælik/ a. 金属的
mould /məuld/ vi. 塑造
outperform /ˌautpəˈfɔːm/ vt. 胜过、优于
patent /ˈpeitənt/ vt. 取得专利
polymer /ˈpɔlimə/ n. 聚合物
prototype /ˈprəutətaip/ n. 原型
recyclable /riːˈsaikləbl/ a. 可重复利用的、可回收的
reversibly /riˈvəːsəbli/ adv. 可逆地
specification /spesifiˈkeiʃən/ n. 技术规格
stronghold /ˈstrɔŋhəuld/ n. 堡垒
toxic /ˈtɔksik/ a. 有毒的

## NOTES

1. all but：几乎
2. are poised to：随时准备着
3. Mobile phones，laptop computers，hand-held video games：大哥大、便携式电脑和手提式游戏机
4. rechargeable batteries：充电电池
5. on the horizon：刚出现
6. Preliminary tests：初步试验
7. charged ions：带电离子
8. conduct electricity：导电
9. bumper to bumper：（车辆）一辆接一辆地，拥塞
10. p-type doping：P-型掺杂
11. n-type doping：N-型掺杂
12. polypyrrole and polystyrenesulphonate：聚吡咯和聚苯乙烯磺酸酯
13. polythiophene：聚噻吩

## QUESTIONS

1. What problems do metallic batteries have?
2. Why have the electrodes been built from metals so far?
3. Why is it possible to make electrodes out of plastic in theory?
4. Why is it difficult to make the plastic equivalent of an anode?
5. What problems do the new plastic battery have?

# 2. Probing into Your Future
# 扫描探针显微镜探知未来

Suppose that you had a technology that you could use to build a new generation of superfast microchips①, to invent novel materials such as crack-resistant plastic and shatter-proof ceramic②; and to make tiny artificial **sensors** and robots—if you could figure out how. What would this machine be like? Would it be a complex robot, perhaps? Or a computer-driven assembly line? What about ... a **microscope**?

"A microscope?!" you say. "You can't make things with a microscope. The last time I checked, a microscope was a magnification and imaging device③."

You're absolutely right. And that's just what the technology just described to you, known as scanning probe microscopy④, was designed to do. There are two types of scanning probe microscope: the scanning tunneling microscope (STM)⑤ and the atomic force microscope (AFM)⑥. Gerd Binnig and Heinrich Rohrer, the inventors of the former, won the Nobel Prize in Physics for this accomplishment in 1986.

The business end⑦ of both STM and AFM is a microscopic probe⑧ kept at an almost **infinitesimal** distance from the surface it is probing. The interactions between the probe and surface are measured to produce an image of the surface. This type of imaging is analogous to being **blindfolded** and trying to figure out what an object is like using your sense of touch (which literally consists of the interactions between the object's surface