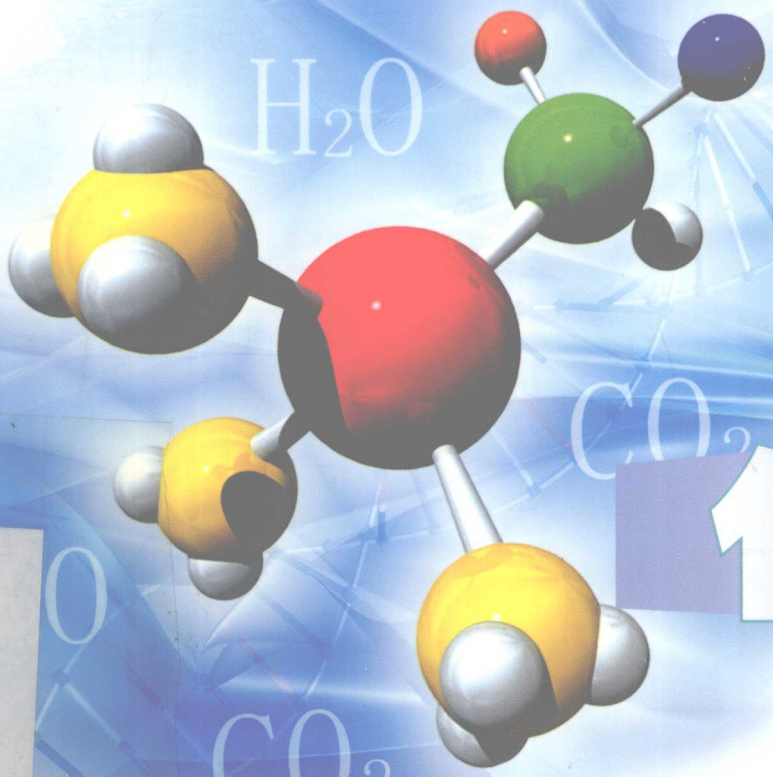
英语版

九年义务教育三年制初级中学教科书

CHEMISTRY

全一册

课程教材研究所
双语课程教材研究开发中心 组译



化学

人民教育出版社
People's Education Press

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英语版初级中学教科书

说　明

随着改革开放的不断扩大，中国在经济和教育、科学、文化等诸多方面与各国间的交往日益增强，中国人学习英语的热情也日趋高涨。在当今社会，是否熟练掌握英语，已成为衡量一个人的知识结构甚至综合素质的一个重要方面。在这样的形势下，多角度、多渠道提高人们的英语水平，特别是提高基础教育阶段在校学生的英语水平，已经成为社会的迫切需要。

为了适应这种新的形势和需要，从2001年起，作为教育部直属单位的课程教材研究所着手研究开发英语版普通高中教科书（包括数学、物理、化学、生物、历史、地理六门必修课程），已由人民教育出版社出版。随后，又继续开发这套英语版初级中学教科书，将包括初中三个年段的代数、几何、物理、化学、生物、历史、地理和信息技术。

这套英语版初级中学教科书，根据经全国中小学教材审定委员会2001年审查通过、人民教育出版社出版的《九年义务教育三年制初级中学教科书》编译而成，主要供实行双语教学的学校或班级使用，也可以作为中学生的课外读物，其他有兴趣的读者也可以作为参考书使用，使学科知识的掌握与英语能力的提高形成一种双赢的局面。

为了使这套英语版教科书具有较高的编译质量，课程教材研究所双语课程教材研究开发中心依托所内各学科教材研究开发中心，在国内外特聘学科专家和英语专家联袂翻译，且全部译稿均由中外知名专家共同审校。

我们的宗旨是：以前瞻意识迎接时代挑战，以国际水平奉献中华学子。

人民教育出版社英语版初级中学教科书，愿与广大师生和家长结伴同行，共同打造新世纪的一流英才。

热诚欢迎广大师生和读者将使用中的意见和建议反馈给我们，使这套教材日臻完善。联系方式：

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课程教材研究所

2003年4月

中文版初级中学《化学》教科书

说　明

本书是根据教育部2000年颁布的《九年义务教育全日制初级中学化学教学大纲（试用修订版）》，以及特级教师和专家对教材的审读意见，在《九年义务教育三年制初级中学教科书化学（全一册）》的基础上修订而成的。经全国中小学教材审定委员会2001年审查通过。

这次修订，旨在更加有利于贯彻党和国家的教育方针，更加有利于对青少年进行素质教育，更加有利于中小学生的全面发展，培养学生的创新精神和实践能力。

参加本次修订工作的有（按修订顺序）冷燕平、李文鼎、乔国才、胡美玲、陈晨、王晶。

李宏庆绘制了部分插图。

责任编辑为冷燕平。

希望广大教师和教学研究人员提出意见和修改建议。

人民教育出版社化学室

2001年2月

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Introduction

We live in a world full of all kinds of matter that are rich and colorful, such as sparkling crystals, clear water, shining metals, beautiful flowers, black coal, white table salt, and so on.

All matter around us changes constantly. For examples, flowing water can evaporate to form vapor that becomes clouds in the sky. And the clouds may turn to raindrops or snowflakes that fall back to the ground. Ore can be smelted into iron and steel that can become iron rust. Coal can be burned into a pile of ashes.

Why is the world full of tens of thousands of different kinds of matter? Why is matter different, for example (in color, state, luster, and odor)? How is matter formed and what is it made of? Why does matter change (e. g. why does iron rust and coal burn)?

You may have found a lot of similar questions in your daily life. You can answer these questions about matter and their changes in the chemistry courses since chemistry is a basic science of nature that studies the composition, structure, and properties of matter, and the laws governing change in matter.

Let's do some experiments that show how matter changes. Pay attention to the color and state of the substances before and after their changes.

Figure 1 Boiling of water

[**Experiment 1**] Fill a test tube with a small amount of water and fix to a support stand (as in Figure 1). Heat the bottom of the tube carefully until the water boils. Move a clean glass (or a small beaker filled with water) near the mouth of the tube. Watch what happens to the glass surface.

[**Experiment 2**] Place two or three pieces of chalcanthite (also called blue vitriol) and grind it in a mortar with a pestle. Watch what happens to the chalcanthite.

Figure 2 Grinding of chalcanthite

[**Experiment 3**] Clamp a small strip of magnesium with tongs and light it (as shown in Figure 3). What happens?

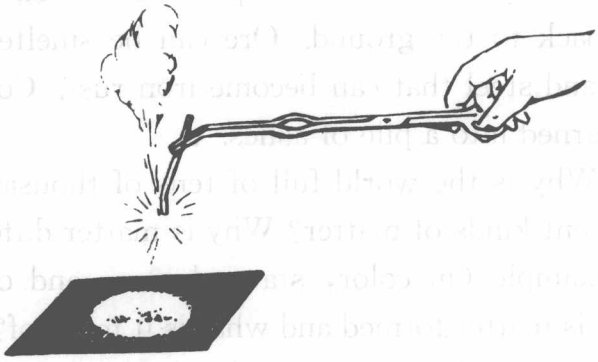


Figure 3 Combustion of a stripe of magnesium

[**Experiment 4**] Add a small amount of copper subcarbonate (also called verdigris) into a dry test tube and plug it with a rubber septum equipped with a curved glass tube. Place the other end of the curved tube in a beaker filled with clear limewater. Heat the test tube and watch the changes of the color of the verdigris and the limewater.

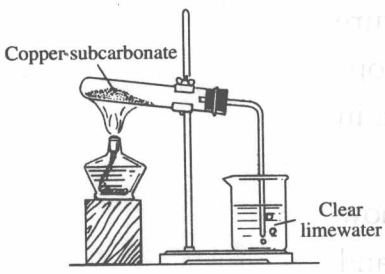


Figure 4 Copper subcarbonate on heating

To help compare substances before and after the changes and during the changes in the four experiments above, the results are listed in the table below:

Number of experiments	Substance before the change	Behaviors during the change of the substance	Substance(s) formed after the change
1	Water in liquid state	Condensation of the vapor formed from boiling water to liquid water on the glass	Water in liquid state
2	Blue chalcanthite pieces	Grinding of solid pieces	Blue chalcanthite powder
3	Silver-white magnesium stripe	Burning, releasing large amounts of heat, and giving off dazzling white light at the same time	White magnesium oxide powder
4	Green copper subcarbonate powder	Change of green powder to black in color when heated, appearance of small water drops on the wall of the tube, and formation of cloudy limewater	Three other substances: copper oxide (black), water, and carbon dioxide

You can see from the table that experiments 1 and 2 have a common characteristic in that the states of the substances change but no new substances form. **A change without forming a new substance(s) is called a physical change.** The things we see in our daily life such as the evaporation of gasoline, the manufacture of desks and chairs from wood, the casting of pots from iron, and melting wax are all physical changes.

You can also see from the table that the common characteristic of experiments 3 and 4 is the new substances made during the changes. **A change in which a new substance is formed is called a chemical change or a chemical reaction.** The things we see in our daily life such as the burning of wood and rust on iron are chemical changes.

In a chemical change, in addition to forming new substance(s), certain reactions occur at the same

time, such as the release of heat, light, a change of color, the release of gases, and the formation of precipitates. These can help us to determine whether a chemical change is happening or not.

Physical changes may occur during a chemical change. For example, as a candle burns, the wax melts, which is a physical change, while the paraffin wax burns to form water and carbon dioxide, which is a chemical change.

What a substance does in a chemical change is called a **chemical property.** For examples, a strip of magnesium can burn in air to form magnesium oxide, iron can form rust and copper can form verdigris in damp air. The property of a substance without a chemical change, such as color, state, small, melting point, boiling point, hardness, and density, is called a **physical property.**

Studing chemistry and understanding the principles of chemical change enable us to use chemical changes for the benefit of human beings. For example, as we understand burning better, we can get heat sufficient and save fuel, and prevent fire. Also as rusting is better understood, it will know how to prevent different metals from rusting.

The study of chemistry enables us to get materials from natural materials, such as gasoline, kerosene, and diesel from petrol, and to make materials that are not in nature. For example, plastics, synthetic fiber, synthetic rubber, detergents, and medicine are made from petrol as the raw material.

The study of chemistry can help people to develop new materials, discover new energy sources, study living things, use natural resources proper-

ly, prevent pollution and protect the environment, increase agricultural production, and improve human health.

The study of chemistry also can help people to study and explore natural sciences, such as physics, biology, geology, and others.

Obviously, the study of chemistry is of great importance for building a socialist future and for advanced studies.

China is one of the countries that has a long history. Some chemical technologies, such as making paper, gunpowder, and porcelain, were invented long ago in China, and they are great contributions to world civilization. Chinese people made exquisite bronze wares in the *Shang Dynasty*, and smelted iron and steel during the *Spring-Autumn-Warring States Period*. However, in modern times the development of science and technology in China has been slow. Before 1949 even kerosene, caustic soda and matches had to be imported. After 1949, the petroleum and chemical industries in China and research in chemical science developed well. Oil fields such as *DaQing*, *ShengLi*, and *DaGang*, were built in China, and ended the dependence on "foreign oil". The chemical industry in China has become an industry of considerable size and scale.

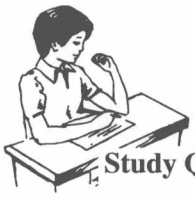
How do you study chemistry? The following points should be kept in mind at all times. You should focus on and carefully perform chemistry experiments. You should be familiar with the composition and properties of important substances. You should understand and be able to use common chemical terms. You should know the basic ideas

and laws of chemistry. You should be familiar with the uses of chemistry in daily life. You should establish and maintain an interest in the study of chemistry. You should develop skills of observation, memory, thinking, hands-on, and self-learning.

Studing hard in school today will prepare you to participate in the socialist society later. A bright future and great challenges lie ahead of you. You should all be confident and aspire to study chemistry for the modernization of China.

Home Experiment

Look at the color, state, and form of a candle and then, light it and put it out after a few minutes later. Watch what happens during the burning of the candle and the record it carefully.



Study Questions

1. (1) What is the difference between a physical change and a chemical change? Illustrate with examples.

(2) What is the difference between the physical property and the chemical property of a substance? Illustrate with examples.

2. Which of these are physical changes and which are chemical changes? Why?

(1) Wet clothes are dried in the sun.

(2) Copper forming verdigris in humid air.

(3) Paper burning.

(4) A porcelain bowl broken in pieces.

(5) Iron rusting.

(6) Wax melting.

3. Why is it said that lighting a candle includes both a physical change and a chemical change?

Chapter 1

Air and Oxygen

There is a thick layer of air arourd the surface of the earth where we live. It not only affects the climate, because air is also essential for the survival of human beings, animals, and plants. Air is also important resource that human beings rely on it for producing goods.

In this chapter, we will study one of the important gases—oxygen.

1.1 Air

Air is important for life in human beings, animals, and plants. It is also an important natural resource. However, the components of air were discovered rather late since it is a gas that can not be seen or smelled. For a long time in the past, air was considered a single substance. Later, scientists studied combustion and the composition of air in great detail and showed that air is not a single substance.

So what kinds of substances is air made of? Let us answer the question with the following experiment.

[**Experiment 1-1**] Apparatus is shown in Figure 1-1. Put a bell-shaped cover in a water bath. Using the water surface as the base line, divide the area above the line into 5 equal parts.

Place on a spoon an amount of red phosphorus. Light the phosphorus with an alcohol burner, put it into the bell-shaped cover and seal the cover firmly with a rubber septum. Notice that as the red phosphorus burns the water level changes.

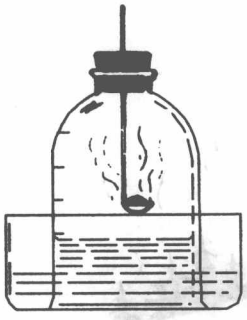


Figure 1-1 Determination of the oxygen percentage in the air

From this experiment you can see that a large amount of white smoke is produced as the red phosphorus burns, and the water level inside the bell-shaped cover rises at the same time. After the burning stops and the white smoke disappears, the water level inside the bell-shaped cover has risen about 1/5.

Why does the burning of the red phosphorus use 1/5 the air inside the bell-shaped cover, and not all of it?