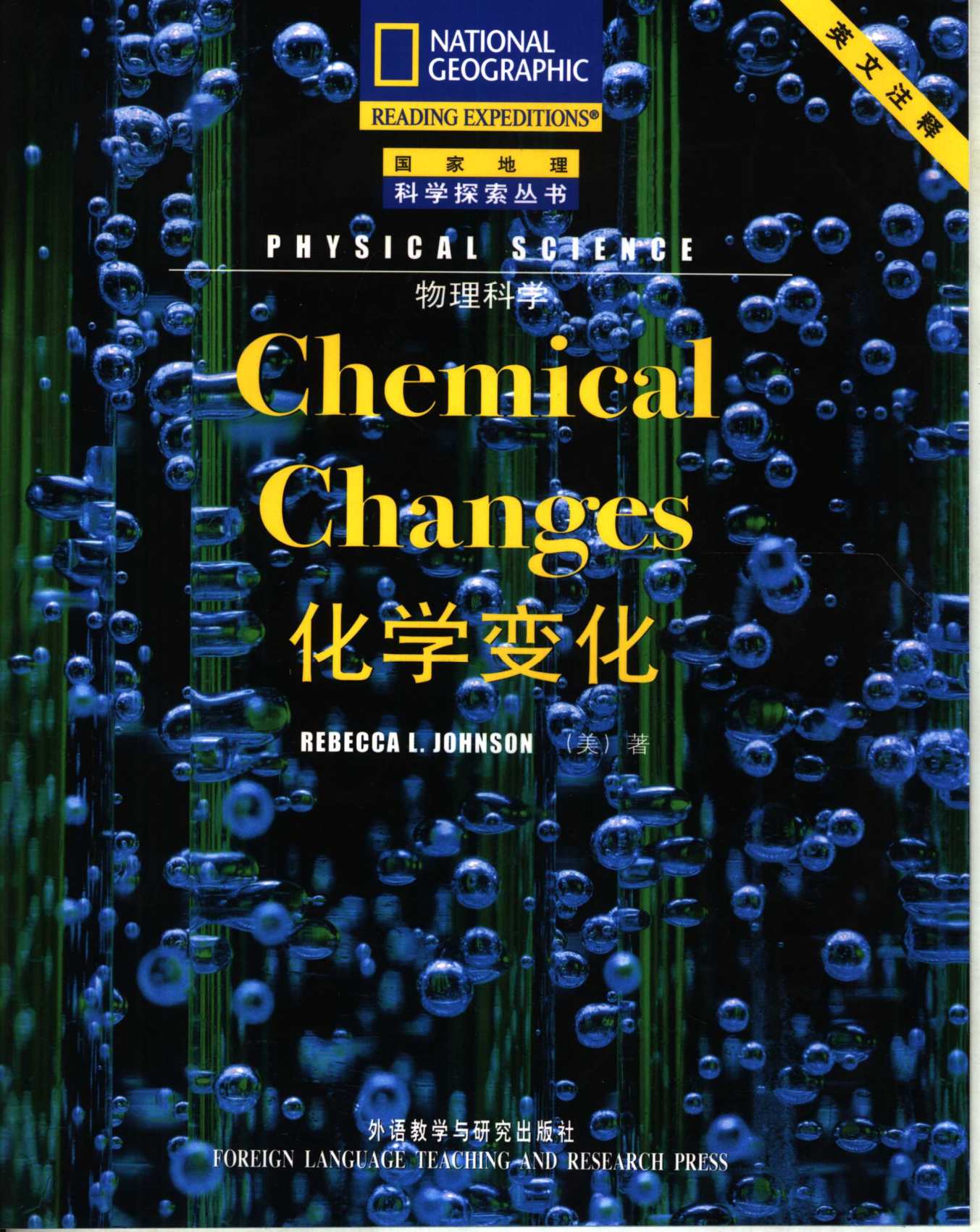

NATIONAL GEOGRAPHIC
READING EXPEDITIONS®
国家地理
科学探索丛书
英文注释
PHYSICAL SCIENCE
物理科学
Chemical Changes
化学变化
REBECCA L. JOHNSON （美）著
外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

京权图字：01－2005－2601

图书在版编目(CIP)数据

化学变化＝Chemical Changes／(美) 约翰逊 (Johnson, R.L.) 著. —北京：外语教学与研究出版社，2005.6
(国家地理科学探索丛书：注释版. 物理科学)
ISBN 7－5600－4893－5

Ⅰ. 化… Ⅱ. 约… Ⅲ. 英语—语言读物 Ⅳ. H319.4:0

中国版本图书馆 CIP 数据核字(2005)第 050937 号

出 版 人：李朋义
责任编辑：田 娜
美术编辑：蔡 颖
出版发行：外语教学与研究出版社
社　　址：北京市西三环北路 19 号 (100089)
网　　址：http://www.fltrp.com
印　　刷：北京画中画印刷有限公司
开　　本：740×975 1/16
印　　张：2
版　　次：2005 年 6 月第 1 版 2005 年 6 月第 1 次印刷
书　　号：ISBN 7－5600－4893－5
定　　价：5.90 元

*　　*　　*

致读者

如果你希望在享受英语阅读乐趣的同时又能增长知识、开拓视野，由外语教学与研究出版社与美国国家地理学会合作出版的“国家地理科学探索丛书”（英文注释版）正是你的选择。

“国家地理科学探索丛书”（英文注释版）第二辑分为8个系列，共46本，内容涉及自然科学和社会研究，除对本套丛书第一辑已包含的“生命科学”、“物理科学”、“地球科学”和“文明的进程”4个系列进行了补充外，又推出了4个新的系列——“生活中的科学”、“科学背后的数学”、“专题研究”以及“站在时代前沿的科学家”。

这套丛书秉承《国家地理》杂志图文并茂的特色，在书中配有大量精彩的图片，文字地道易懂、深入浅出，将科学性和趣味性完美结合，称得上是一套精致的小百科全书。特别值得一提的是本套丛书在提高青少年读者英语阅读能力的同时，还注重培养他们的科学探索精神、动手能力、逻辑思维能力和沟通能力。

本套丛书既适合学生自学，又可用于课堂教学。丛书各个系列均配有一本教师用书，内容包括背景知识介绍、技能训练提示、评估测试、多项选择题及答案等详尽的教学指导，是对课堂教学的极好补充。

英文注释

NATIONAL GEOGRAPHIC

国家地理科学探索丛书

PHYSICAL SCIENCE

物理科学

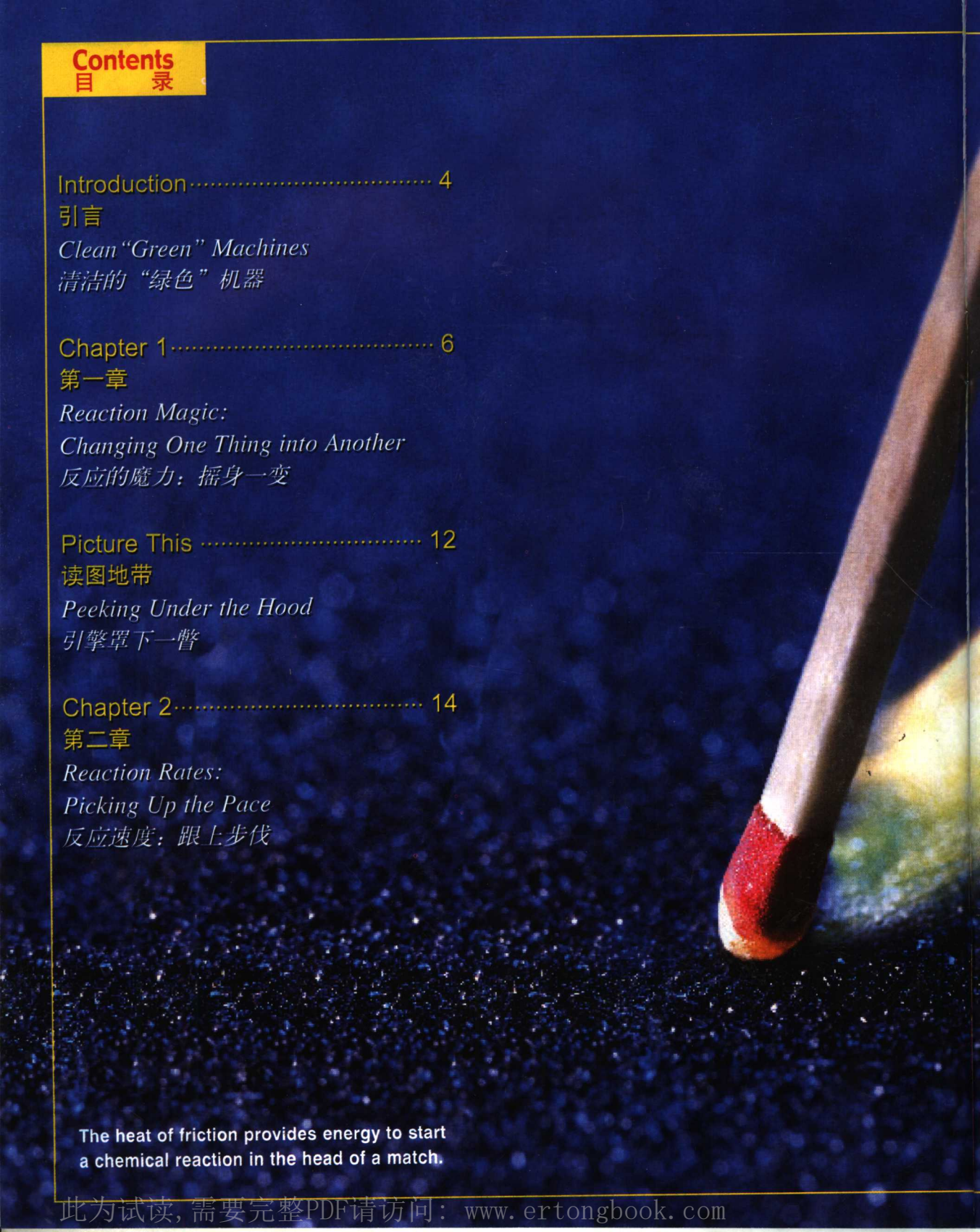
Chemical Changes

化学变化

REBECCA L. JOHNSON（美）著

外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS
北京 BEIJING

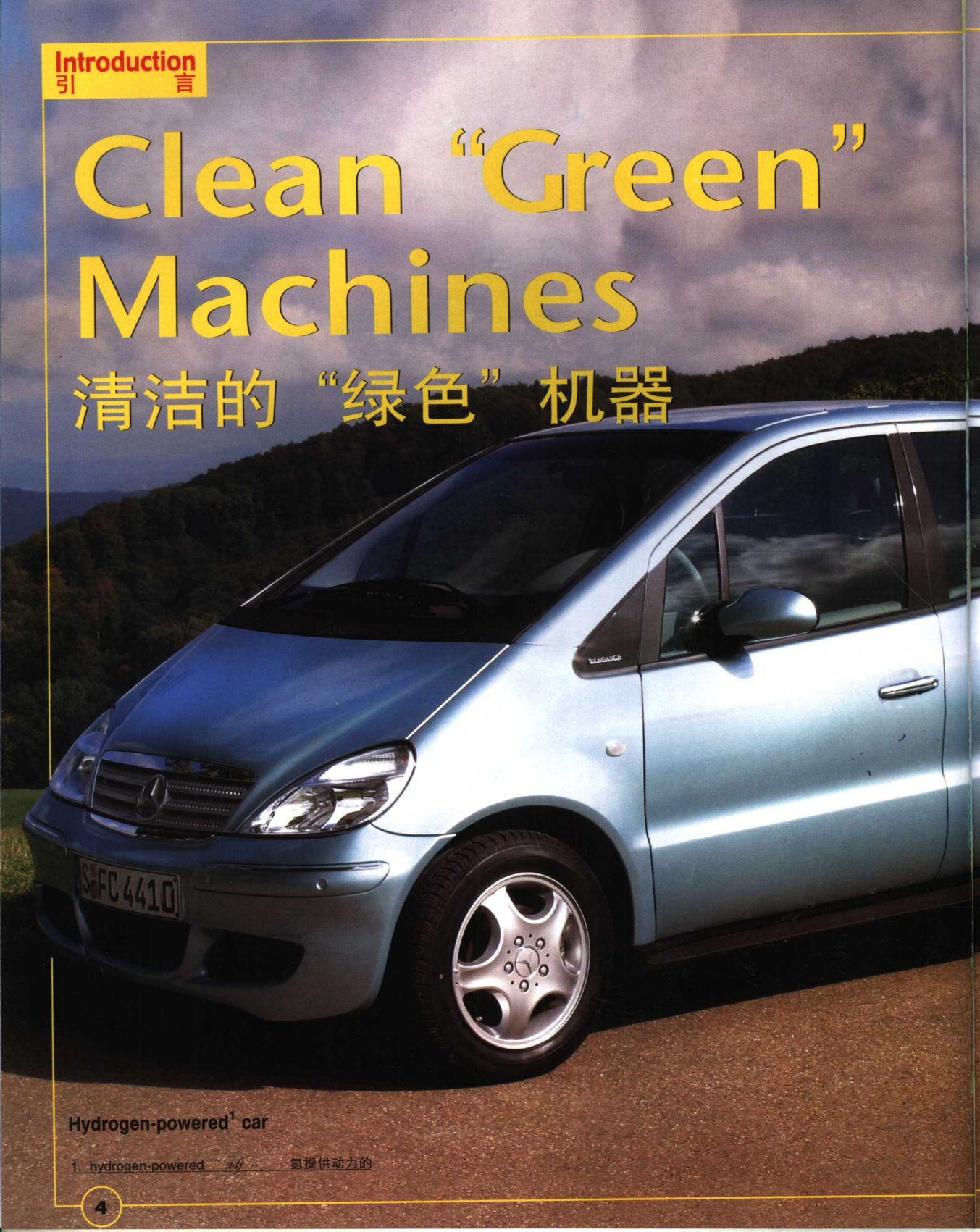
Contents
目　录



The heat of friction provides energy to start a chemical reaction in the head of a match.

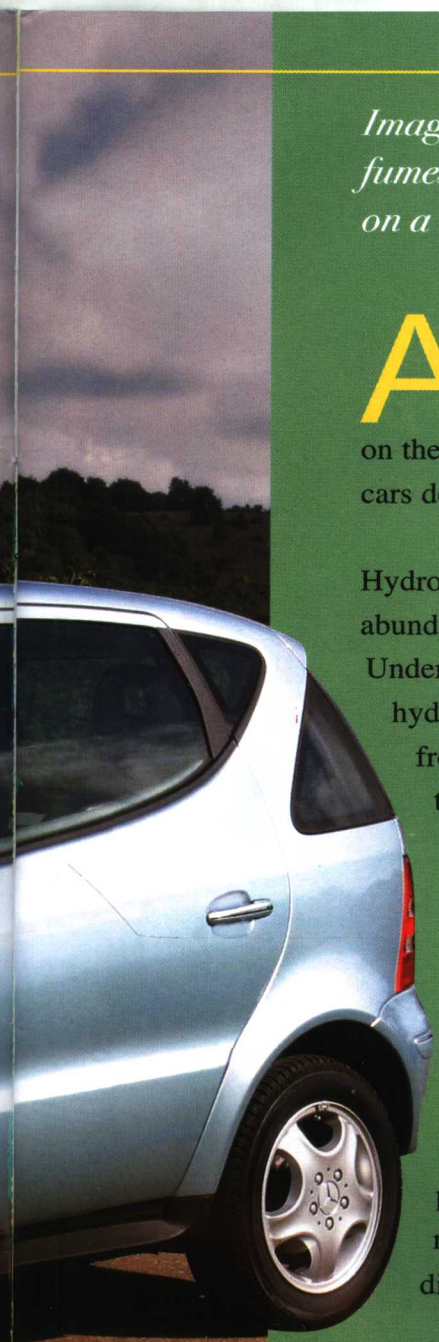
Clean "Green" Machines

清洁的"绿色"机器



Hydrogen-powered[1] car

1. hydrogen-powered *adj.* 氢提供动力的



Imagine—no clouds of choking[1] exhaust[2]. No smelly[3] fumes[4] at the gas station. You'll zoom[5] down the highway[6] on a tank[7] of . . . hydrogen!

A car that runs on hydrogen rather than gasoline[8]? Sounds like science fiction[9]. But by the time you learn to drive, it's likely that you'll see lots of hydrogen cars on the road. They'll look pretty much like cars do today. But they won't pollute[10]!

Currently NASA[20] is the biggest user of hydrogen.

Hydrogen is the simplest and most abundant[11] element[12] in the universe. Under the hood of a hydrogen car, hydrogen combines[13] with oxygen[14] from the air to produce electricity[15] that powers the car. The only thing left over is pure water, which comes out of the tail pipe[16] as steam[17]!

By harnessing[18] this simple chemical reaction, the whole world may change the way it drives. But that's the nature of chemical reactions—they are all about change! Right now, millions[19] of different kinds of chemical reactions are taking place around you—and inside you. So just what are chemical reactions? And why are they so important? In this book you'll discover the answers to these questions—and a whole lot more!

1. choking	*adj.*	令人窒息的	11. abundant	*adj.*	充足的
2. exhaust	*n.*	废气	12. element	*n.*	元素
3. smelly	*adj.*	有（强烈或难闻）气味的	13. combine	*v.*	化合
4. fume	*n.*	烟；气；汽	14. oxygen	*n.*	氧气
5. zoom	*v.*	（指汽车等）急速移动	15. electricity	*n.*	电
6. highway	*n.*	公路	16. tail pipe		排气尾管
7. tank	*n.*	箱；罐	17. steam	*n.*	水蒸气；蒸汽
8. gasoline	*n.*	汽油	18. harness	*v.*	利用
9. science fiction		科学幻想小说	19. million	*n.*	[~s] 许多；无数
10. pollute	*v.*	污染	20. NASA		（美国）国家航空和航天局

Chapter 1
第一章

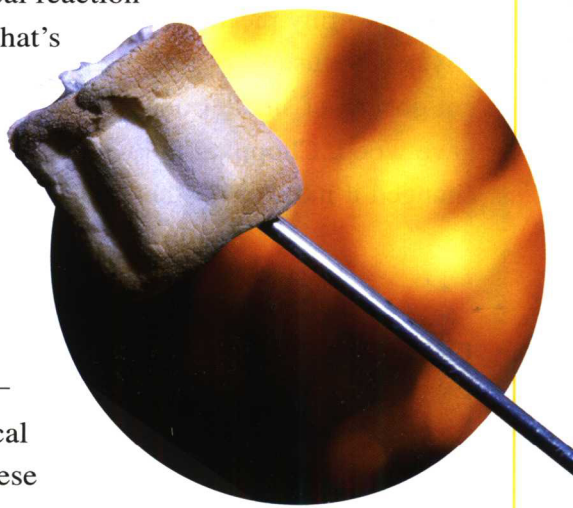
Reaction Magic:

Changing One Thing into Another

反应的魔力：摇身一变

What could be better than a camping trip? You are roasting[1] marshmallows[2] over a crackling[3] fire. The sun is shining. You're on vacation—but all around you chemical reactions are at work.

See that warm, flickering[4] fire? It's a chemical reaction in progress. So is the crispy[5] brown crust[6] that's forming on the marshmallows. Even the act of reading this book is the result of chemical reactions taking place throughout your body.



Chemical reactions are everywhere. When food cooks or tent stakes[7] rust[8] or trees grow, chemical reactions take place. When you digest[9] those marshmallows, use your muscles[10] to stir[11] the fire—even when you just think about something—chemical reactions are involved[12]. How can we understand these fantastic forces?

We can start by defining[13] them. In simple terms, a chemical reaction occurs[14] when two or more substances[15] interact[16] to form something new. You start out with reactants[17]. During the reaction they are transformed[18] into different substances—the products[19].

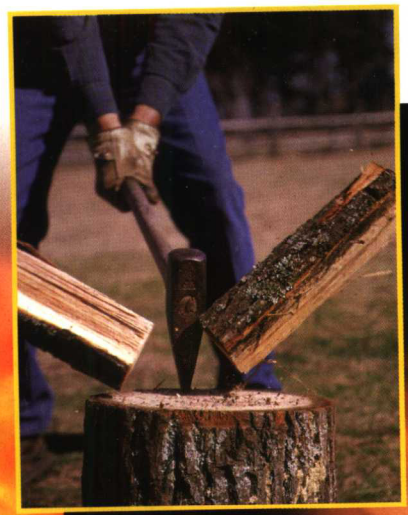
1. roast	*v.*	烤	11. stir	*v.*	拨动
2. marshmallow	*n.*	果浆软糖	12. involve	*v.*	涉及
3. crackling	*adj.*	噼啪作响的	13. define	*v.*	给……下定义
4. flickering	*adj.*	闪烁的	14. occur	*v.*	发生
5. crispy	*adj.*	脆的	15. substance	*n.*	物质
6. crust	*n.*	硬外皮	16. interact	*v.*	互相作用
7. stake	*n.*	桩	17. reactant	*n.*	反应物
8. rust	*v.*	生锈	18. transform	*v.*	使……改变性质
9. digest	*v.*	消化（食物）	19. product	*n.*	生成物
10. muscle	*n.*	肌肉			

Physical vs. Chemical Change

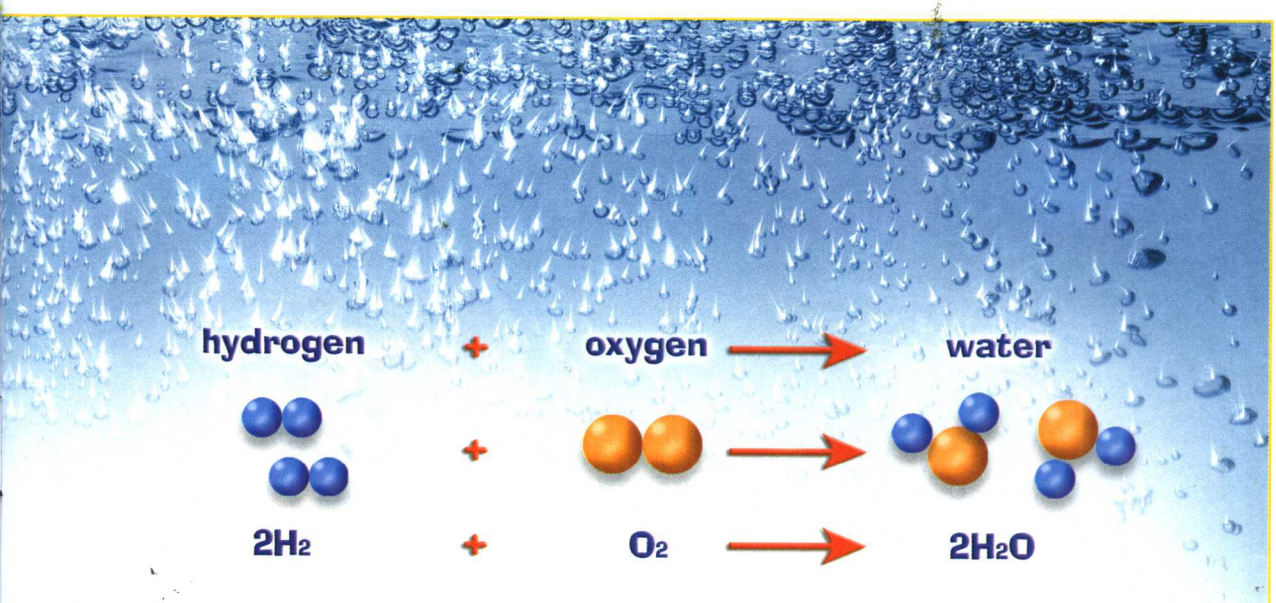
Ending up with something new is the big difference between a chemical reaction and a simple physical change. If you chop[1] a log[2] into tiny pieces, you've changed it physically. Instead of one big piece, you've got dozens of smaller ones. But you still have wood. Chopping the wood hasn't changed it into some other substance.

But if you toss[3] that log onto the campfire[4], it burns. After the flames[5] disappear and the smoke clears, only ashes remain. The wood is gone. In its place is something else. A chemical reaction has occurred.

1. chop	*v.*	砍；劈
2. log	*n.*	原木；短棍木柴
3. toss	*v.*	扔
4. campfire	*n.*	营火；篝火
5. flame	*n.*	火焰



Chopping wood causes a physical change. Burning wood causes a chemical change.



New Arrangements

So now you know what a chemical reaction is. But just *how* are new substances created as the result of one? During a chemical reaction, atoms[1] that make up molecules[2] are rearranged. Some of the bonds[3] that hold them together are broken. As the reaction proceeds[4], the atoms rejoin[5] in different ways. New bonds are formed, and molecules of different substances are created.

As a simple example of this rearranging process[6], let's take a look at the chemical reaction that occurs in a hydrogen car. Inside the car, molecules of hydrogen gas and oxygen gas break apart and recombine[7] to form molecules of water. Look at the diagram[8] above. The colored balls represent atoms and molecules that are rejoining in a chemical reaction.

See how the atoms have been rearranged? At first the hydrogen atoms and oxygen atoms were bonded together in pairs. Then the atoms recombined, joining together in new ways to produce water molecules.

There are many different ways that atoms get reshuffled[9] in chemical reactions. But no matter how it happens, you can count on[10] one thing when the reaction is over—you'll end up with something new!

1.	atom	*n.*	原子
2.	molecule	*n.*	分子
3.	bond	*n.*	键
4.	proceed	*v.*	继续进行
5.	rejoin	*v.*	重新接合
6.	process	*n.*	过程
7.	recombine	*v.*	重新结合
8.	diagram	*n.*	图表
9.	reshuffle	*v.*	重新安排
10.	count on		指望，料想

Chemical Reaction Clues[1]

Obviously[2], you can't see atoms reshuffling when chemical reactions occur. But sometimes you can see, smell, and hear signs[3] that this reshuffling is taking place.

Sparks[4] that fly off of flares[5] or sparklers[6] are signs of a chemical reaction. So are bubbles[7] of gas that form when you mix vinegar[8] or lemon juice with baking soda[9] or the soap scum[10] left around the tub[11] after a bath. Other clues that a chemical reaction is taking place include smoke, light, heat, strange odors[12], and color changes.

1. clue	*n.*	线索
2. obviously	*adv.*	显然
3. sign	*n.*	迹象
4. spark	*n.*	火花；火星
5. flare	*n.*	（短暂的）旺烧火
6. sparkler	*n.*	闪闪发光之物
7. bubble	*n.*	泡；泡沫
8. vinegar	*n.*	醋
9. baking soda		小苏打；碳酸氢钠
10. scum	*n.*	浮渣；泡沫
11. tub	*n.*	浴缸
12. odor	*n.*	气味

Energy on the Move

Chemical reactions involve changes in the arrangement of atoms. But they also involve something else—a change in energy. Overall[1], energy may be absorbed[2] or released[3] as a reaction takes place. This energy often takes the form of light, electricity, or heat.

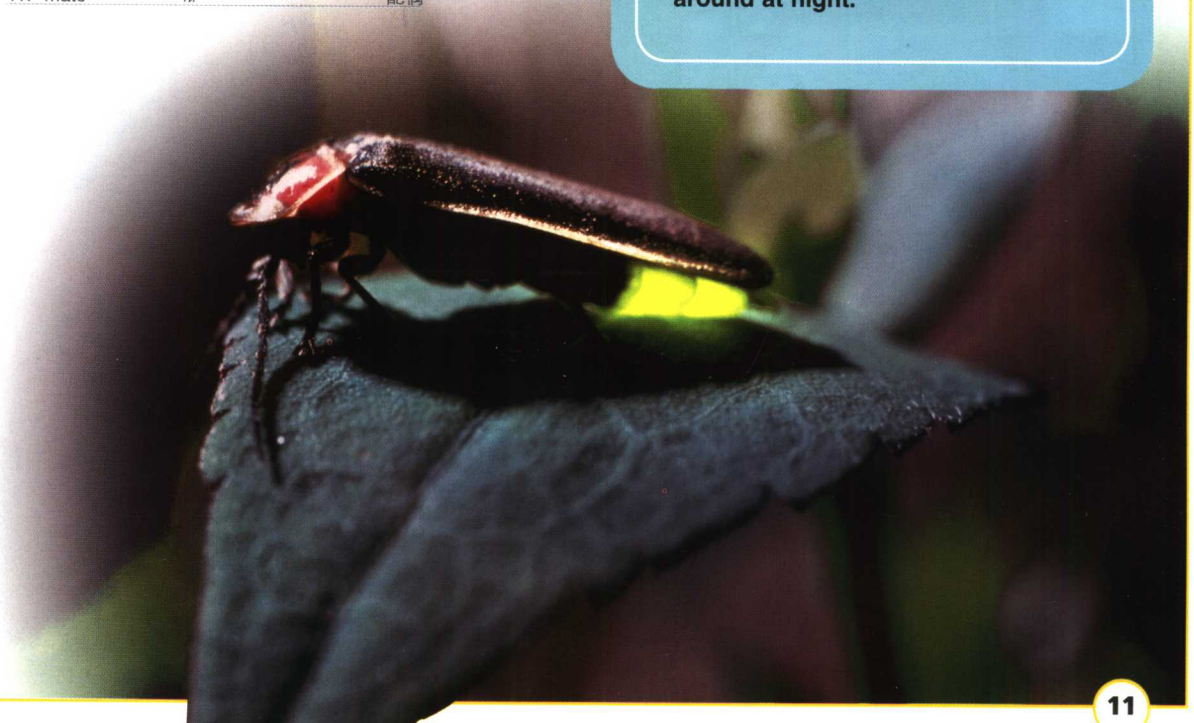
When wood or other substances burn, light and heat energy are released. Some heat-producing reactions happen so quickly that an explosion[4] results. It's this explosive[5] release of energy that puts the fire into fireworks[6], giving them such powerful brilliance[7].

1. overall	*adv.*	总的说来
2. absorb	*v.*	吸收
3. release	*v.*	释放
4. explosion	*n.*	爆炸
5. explosive	*adj.*	爆炸的
6. firework	*n.*	爆竹；花炮；烟火
7. brilliance	*n.*	光辉
8. firefly	*n.*	萤火虫
9. cell	*n.*	细胞
10. insect	*n.*	昆虫
11. mate	*n.*	配偶

Did you ever wonder...

. . . how fireflies[8], or lightning bugs, make their own light?

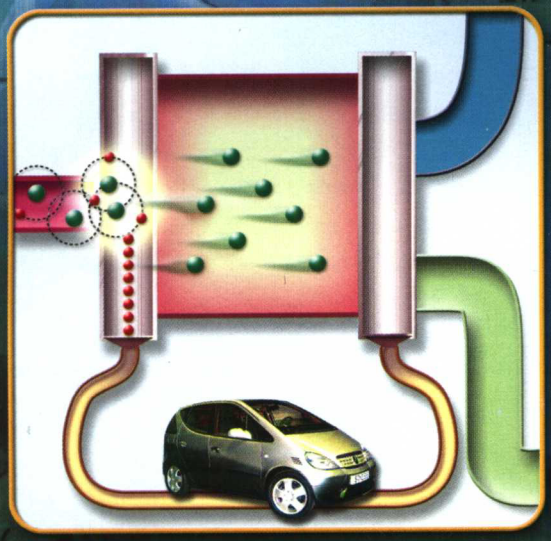
A firefly's flashes are the result of a chemical reaction that takes place in certain cells[9] in the insect's[10] body. Inside the cells, chemicals mix together. During the reaction, light is given off. Fireflies use their flashing lights to attract mates[11] as they fly around at night.



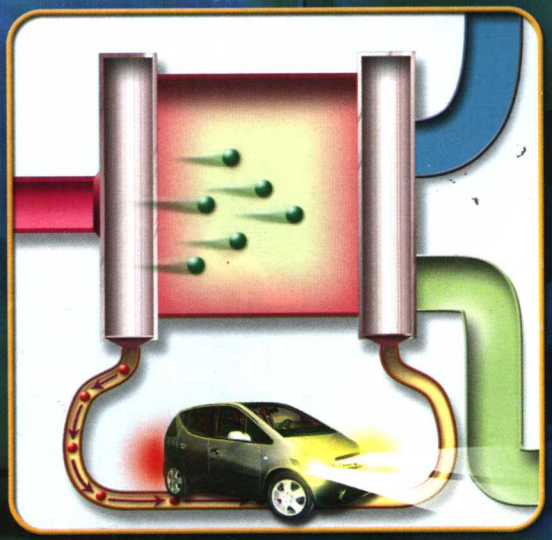
Peeking Under the Hood

引擎罩下一瞥

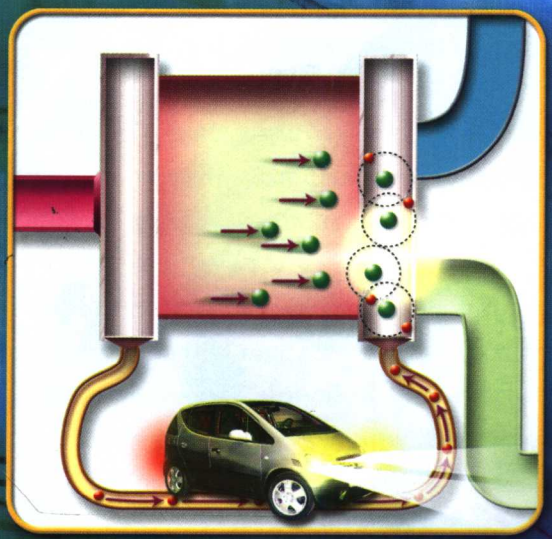
A hydrogen fuel cell[1] car runs on hydrogen. Instead of an engine[2], the car has a motor powered by fuel cells. In the fuel cells, reactions involving hydrogen and oxygen take place. Let's see how they work.



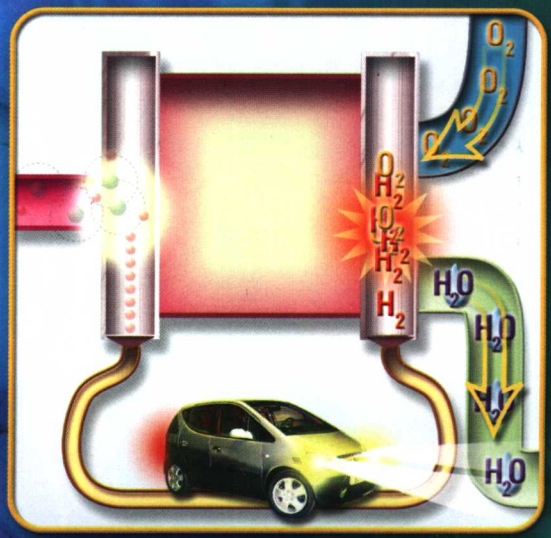
▲**Step 1:** Hydrogen from the fuel tank passes through a special membrane[3]. There the electrons[4] are stripped[5] from the hydrogen atoms. （注释见第 13 页）



▲**Step 2:** The electrons can't pass through the membrane. Instead, they flow out through a wire, creating electricity that powers the car.



▲**Step 3:** The stripped hydrogen atoms can pass through the membrane. When they reach the other side of the membrane, they pick up their lost electrons.



▲**Step 4:** The complete hydrogen atoms then meet up with[6] oxygen from the air and POOF[7]! The hydrogen and oxygen combine chemically to make water, which shoots from the exhaust pipe[8] as steam.

1. fuel cell 燃料电池
2. engine *n.* 发动机，引擎
3. membrane *n.* 薄膜，膜状物
4. electron *n.* 电子
5. strip *v.* 剥去
6. meet up with 和……连接
7. poof *int.* 噗
8. exhaust pipe 排气管

Key

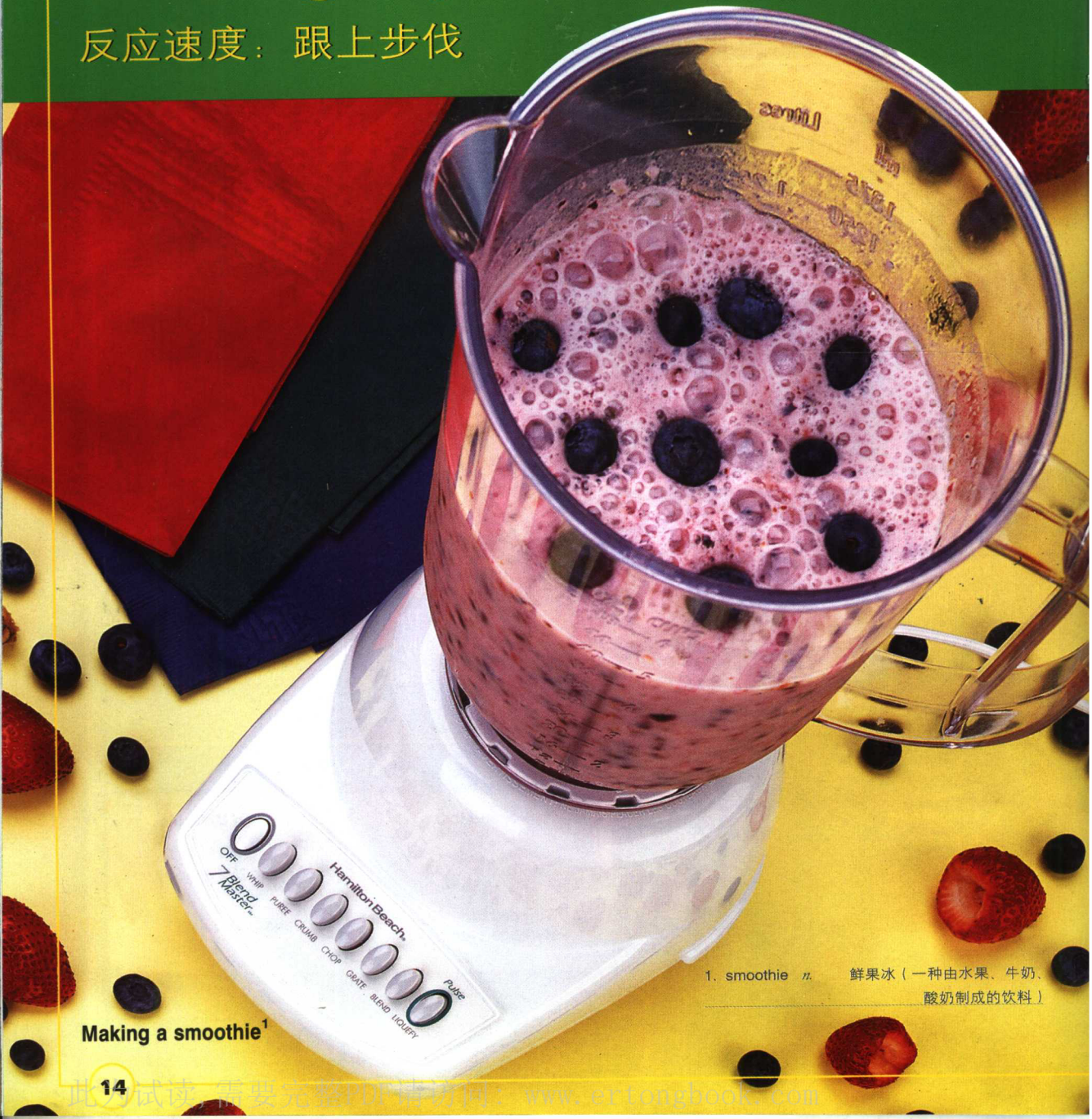
Hydrogen Atom	H_2 Hydrogen Molecule
Electron	O_2 Oxygen Molecule
Stripped Hydrogen Atom	H_2O Water Molecule

Chapter 第二章 2

Reaction Rates:

Picking Up the Pace

反应速度：跟上步伐



Making a smoothie[1]

1. smoothie *n.* 鲜果冰（一种由水果、牛奶、酸奶制成的饮料）