化学专业英语文选

下　册

南京大学外文系普通英语教研组编

商　务　印　书　馆

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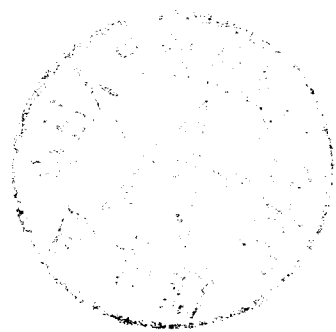

商　务　印　书　馆
1973年·北京

内 容 提 要

化学专业英语文选下册包括三十课：与上册一样，每课除正文外，还有词汇、词组和课文注释，注释中对重要的语法现象都加以词法的和句法的分析，并附有译文，使读者减少理解上的困难．单词用国际音符标注．书末附总词汇表，以利读者查阅．

本书可供中学学过三年以上英语，掌握了基本英语语法知识并熟悉基本单词的高等学校专修化学的学生使用，也可作为研究化学的读者自修英语的参考书。

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南京大学外文系普通英语教研组编

商 务 印 书 馆 出 版

（北京人民路 36 号）

新华书店北京发行所发行

北京第二新华印刷厂印刷

787×1092 毫米 1/32 5 13/16 印张 150 千字

1962 年 5 月初版 1973 年 7 月北京第 7 次印刷

统一书号：9017·330 定价：0.46 元

本书所用语法术语略语

a.	adjective	(形容詞)
adv.	adverb	(副詞)
conj.	conjunction	(連接詞)
n.	noun	(名詞)
num.	numeral	(数詞)
p.a.	participial adjective	(分詞形容詞)
pl.	plural	(复数)
p.p.	past participle	(过去分詞)
prep.	preposition	(前置詞)
pron.	pronoun	(代詞)
sing.	singular	(单数)
v.	verb	(动詞)

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1. RADIOACTIVITY AND TRANSMUTATION OF ELEMENTS (I)

It has been found that a number of chemical elements give off peculiar radiations which have much the same effect as the X-ray. In other words, they will penetrate such materials as black paper, affect a photographic plate, discharge an electroscope, and cause fluorescence in certain minerals. These effects were first discovered in 1896 by Becquerel, a French scientist, as he was examining a crystal of a salt of the element uranium. The general phenomenon was called radioactivity. Pierre Curie and his wife, starting with this discovery, were able to isolate two or three other elements which were much more radioactive than uranium. The first of these to be obtained was polonium, named by Madame Curie after her native land, Poland. But another radioactive element, radium, was found by them in larger quantities and is the most important of the three.

Radium is a metal which chemically closely resembles barium and is in fact the next element below it in the periodic table. A number of its salts and the free metal itself have been prepared. As regards their purely chemical properties, there is little to distinguish the element from the rest of the calcium family.

Radium and all its salts are, however, extremely radioactive. This property is quite independent of the nature of the salts and is as apparent in radium bromide as in the free metal. In fact, what is sometimes spoken of as "radium" is in reality the salt radium bromide. It is the common form in which the element is kept and used. Radioactivity thus seems to be a property of the radium atom and to be independent of its chemical combination.

The extreme radioactivity of radium and its salts can be shown by the effect on a photographic plate, by the discharge of an electroscope, or by a fluorescent screen.

It has been found that radium salts are actually giving off three kinds of radiation which differ widely in their penetrating power and in the way in which they are affected by an electric field. Those called the alpha (α) particles have very little penetrating power and are found to be positively charged particles, or atoms, of helium. The beta (β) rays are much more penetrating and are, in fact, merely a stream of electrons, exactly like those found in the vacuum tube. The gamma (γ) rays are not affected by an electric field and are nothing but very short X-rays which are produced by the action of the beta rays on some of the solid material through which they pass.[1] It is these gamma, or X-rays which give to radium the extreme radioactivity which was first noticed.

Another very surprising property of radium and its salts is that the nature and amount of its radioactivity are entirely independent of temperature and of any other known conditions.

There is still another remarkable property of radium salts: they are continuously producing heat and are generally three to five degrees warmer than the surrounding atmosphere. The amount of heat evolved has been measured and found to be such that one gram of radium salt gives off 100 calories per hour. This constant evolution of heat apparently goes on indefinitely. But, as a matter of fact, we shall see later that this is not the case, that the known quantity of radium is gradually disappearing, and that at the end of about 1600 years it will be half gone.[2] Radium is thus not a source of perpetual energy as has sometimes been stated.

We have seen that the beta rays are a stream of elec-

trons. The alpha particles have been shown to be positively charged helium atoms.

Besides helium, we can obtain from radium another gas which was first known as radium emanation but is now called radon.[3] This gas is continuously being given off by radium compounds and can be pumped away from radium salt and obtained quite pure. Radon is clearly a definite element and finds a place in the periodic system as the last member of the family of rare gases. It is chemically inert, is monatomic, and has the molecular weight 222, exactly four units less than the atomic weight of radium. We thus see that from radium we have obtained two separate elements. These are helium, which we already know, and radon. The formation of helium and radon proceeds continuously in all radium compounds. This must be due to a disintegration of the radium atom itself. Hence we have here the atom of one element actually being transformed into the atoms of two other elements. The atomic weight of radon is in this connection significant. It is exactly the difference between the atomic weights of radium and helium.

The radiations given off by radium (in particular the beta rays and their secondary product, the gamma rays) are extremely active. With their aid it is possible to take pictures in exactly the same way as with the X-rays generated by an electric current in a vacuum tube. Radium radiations, however, have a very powerful effect on all living matter, and it has been thought that they might be useful in curing various diseases.[4] The results have not been so successful as was first hoped. But in treating certain kinds of cancer and similar growths, radium seems to be very beneficial.

詞　汇

radioactivity [ˌreidiouæk'tiviti] *n.* 放射性

transmutation [ˌtrænzmju'teiʃən] *n.* 嬗变

radiation [ˌreidi'eiʃən] *n.* 輻射綫
penetrate ['penitreit] *v.* 深入，穿透
photographic plate [foutə'græfik pleit] 照相底片
electroscope [i'lektrəskoup] *n.* 驗电器
discharge [dis'tʃɑ:dʒ] *v.* 放电
fluorescence [fluə'resns] *n.* 螢光性
uranium [juə'reiniəm] *n.* 鈾
phenomenon [fi'nɔminən] *n. sing.* 現象
phenomena [fi'nɔminə] *n. pl.* 現象
Pierre Curie [piə 'kjuəri] 居里
isolate ['aisəleit] *v.* 分离出
Madame Curie [mə'dɑ:m] 居里夫人
native land ['neitiv lænd] 祖国
Poland ['pouland] *n.* 波兰
resemble [ri'zembl] *v.* 象
apparent [ə'pærənt] *a.* 显然的
screen [skri:n] *n.* 幕，屏
electric field 电場
alpha (α) rays ['ælfə reiz] *n.* α射綫
beta (β) rays ['bi:tə] *n.* β射綫
gamma (γ) rays ['gæmə] *n.* γ 射綫
extreme [iks'tri:m] *a.* 极度的
surrounding [sə'raundiŋ] *a.* 周围的
perpetual [pə'petjuəl] *a.* 不間断的
emanation [ˌemə'neiʃən] *n.* 放射，射气
radon ['reidɔn] *n.* 氡
pump [pʌmp] *v.* 抽
monatomic [mɔ'nætəmik] *a.* 单原子的
disintegration [ˌdisinti'greiʃən] *n.* 分裂，裂变
generate ['dʒenəreit] *v.* 产生，发生
cure ['kjuə] *v.* 医治
disease [di'zi:z] *n.* 疾病
cancer ['kænsə] *n.* 癌
growth [grouθ] *n.* 贅瘤
beneficial [beni'fiʃəl] *a.* 有益的

詞　組

to have much the same effect as 具有和...大致相同的效果
in other words 換言之
to resemble closely 很象
as regards 至于
independent of 与...无关
this is not the case 不是这样的
due to 由于
in this connection 在这方面
in particular 尤其

課文注釋

1. The gamma (γ) rays are not affected by an electric field and are nothing but very short X-rays which are produced by the action of the beta rays on some of the solid material through which they pass. 本句是主从复合句. The gamma (γ) rays ... but very short X-rays 是主句; which ... the solid material 是定語从句，修飾 X-rays; 而另一定語从句 through which they pass 則是修飾 material 的. 本句譯文: "γ 射綫不受电場影响; 它們不过是 β 射綫在通过一些固体物质时作用于它們而产生的短的 X 射綫."
2. But, as a matter of fact, we shall see later that this is not the case, that the known quantity of radium is gradually disappearing, and that at the end of about 1600 years it will be half gone. 本句是主从复合句. 主句是 we shall see later, 三个 that 引出三个宾語从句. as a matter of

fact 是插入語，作“事实上”，“其实”解，和 in reality 是同义. 本句譯文：“而事实上我們以后将知道情况并非如此，这一定量的鐳逐漸在消失，过了 1600 年左右它就会失去一半.”

3. Besides helium, we can obtain from radium another gas which was first known as radium emanation but is now called radon. 在这句中 was known as 是 to be known as 的一般过去时态的单数第三人称形式. as 用作前置詞，后跟名詞，to be known as 作“叫做”解. 和 to be called 是同义表达手段，但后者与名詞連用时不带前置詞. 句中的 radium 和 radon 都是主語补足語. 本句譯文：“除了氦之外，我們还可以从鐳中获得另外一种气体，它起初叫做鐳射气，但是現在叫做氡.”

4. Radium radiations, however, have a very powerful effect on all living matter, and it has been thought that they might be useful in curing various diseases. 在这复合句中 Radium radiations have a very powerful effect on all living matter 及 it has been thought 是并列的. that they might be useful in curing diseases 是名詞性从句，是 has been thought 的实际上的主語. 本句譯文：“而鐳的輻射綫对于一切有生命物质有极强的效应，人們认为鐳的射綫可以用于治疗疾病.”

2. RADIOACTIVITY AND TRANSMUTATION OF ELEMENTS (II)

The beta rays which are given off by a sample of radium salt are not a part of the decomposition of radium into radium emanation but are the result of later changes. Radium emanation itself changes into another element, a solid called radium A, at the same time producing another alpha particle (a charged helium atom). Radium A disintegrates and forms successively radium B, C, D, E, and F. When radium F breaks up, it forms an element, radium G, the atomic weight of which is 206. In each case the change is attended by the production of an electron or of an alpha particle. The electrons emitted in the later stages of the disintegration of the radium atom are the beta rays which are given off by the radium salt.

It will be noticed that the last product of the change is radium G. This is no longer radioactive because it undergoes no further changes and gives off no charged particles.

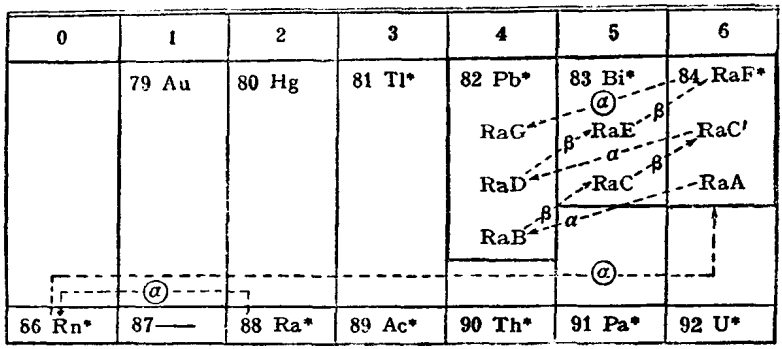
This substance shows all the chemical properties of ordinary lead and cannot be distinguished from the latter except that it has a lower atomic weight and a different density. In other words, radium G is an isotope of ordinary lead.

An examination of the lead formed in radioactive ores (that is, ores which contain radium) shows that it has an atomic weight and a density different from ordinary lead. This lead (radium G) was probably formed in that particular ore by the disintegration of the radium atoms. The experimental demonstration of the existence of two kinds of lead, identical in chemical properties and X-ray spectra but different in properties involving atomic mass, was the first proof of the existence of isotopes.

Every expulsion of a helium atom in the form of an alpha particle should lower the atomic weight of the element by four units (the atomic weight of helium). There are five such changes between radium and radium G, the end point. Subtracting these twenty units (5 × 4) from the atomic weight of radium (226) gives 206 for the atomic weight of radium G. The experimentally determined atomic weight of lead from pure radium ore is almost exactly 206 as compared with 207.2 for ordinary lead. That this "lead" is really radium G seems established beyond doubt, and our general picture of the radium disintegration is complete.

The accompanying diagram shows the position in the periodic table of the various disintegration products of radium. The position of these elements has been determined by their X-ray spectra and is verified by their chemical properties. It will be noted that in group 4 there are 3 elements which are isotopes of ordinary lead.[1] Two of these, radium B and radium D, are radioactive; the other, radium G, is inactive, as explained above. Similarly, in group 5 we have two radioactive elements which are isotopes of ordinary bismuth.

There are other disintegration series besides the radium series. Thorium seems to be the starting point of a series of



Last two rows of the periodic table, showing the position of the disintegration products of radium. A star (*) marks the positions occupied by the given elements and by the disintegration products of the thorium and uranium series.

radioactive elements. Probably radium itself has been slowly formed as a product of the radioactive disintegration of uranium and is therefore really not the starting point but the middle of a series. The elements formed in the thorium and uranium series occupy positions in the periodic series indicated by a star in the diagram.

The most probable explanation of radioactive disintegration is to be found in terms of the modern ideas concerning the structure of matter. We have already seen that we can picture an atom as made up of a positive nucleus surrounded by electrons. The disintegration of radioactive elements appears to be a disintegration of the nucleus. Thus, when a radioactive element disintegrates, either an electron (a beta particle) is shot from within the nucleus or a doubly charged helium atom (an alpha particle) from the same source; or both changes may occur.[2] The loss of one electron from the nucleus increases the net positive charge (the atomic number) by one; the newly formed element therefore belongs

in the next place to the right in the periodic table. On the other hand, the loss of a doubly positively charged helium atom decreases the net nuclear charge by two, and the new element must be placed two groups to the left. If two electrons and one alpha particle are emitted, the new element has the same nuclear charge and the same atomic number, and is isotopic with its parent. The accompanying diagram illustrates these changes. These have been studied by physical measurements of the characteristic radiations emitted by the elements during the disintegration. In many cases the life of one of the elements is so short that it is half disintegrated in a few minutes. In almost all cases the amounts of the substances involved have been too small to see or even to weigh. The results are nevertheless beyond dispute, thanks to the accuracy of the physical methods of measuring the characteristics of the electrons and alpha particles shot off from these spontaneously exploding nuclei.[3]

This nuclear decomposition of the radioactive elements, it must always be remembered, does not involve any of the electrons outside the nucleus. These electrons merely rearrange themselves in the newly formed element to correspond to the positive charge on the nucleus. The chemical properties of a certain element which depend on the arrangement of these electrons (particularly the outer, or valence electrons) are the same whether the element be formed as a result of radioactive change or not.[4] This has already been mentioned in the case of the leads, which, being end-products of radioactive changes, are themselves inactive. And their differences can be detected only by atomic weight or density determinations.

詞　汇

sample ['sɑ:mpl] *n.* 样品
later ['leitə] *a.* 后来的
charged [tʃɑ:dʒd] *p.a.* 带电的
disintegrate [dis'intigreit] *v.* 分裂
successively [sək'sesivli] *adv.* 相继地
emit [i'mit] *v.* 射出，放射

stage [steidʒ] *n.* 阶段，时期
latter ['lætə] *a.* 后者
isotope ['aisoutoup] *n.* 同位素
ore [ɔə] *n.* 矿石
demonstration [ˌdemən'streiʃən] *n.* 演示，显示
identical [ai'dentikəl] *a.* 同一的
spectra ['spektrə] *n.pl.* 光譜
expulsion [iks'pʌlʃən] *n.* 放出，逐出
lower ['louə] *v.* 降低
end point 終点
subtract [sʌb'trækt] *v.* 減去
beyond [bi'jɔnd] *prep.* 超出
doubt [daut] *n.* 怀疑
diagram ['daiəgræm] *n.* 图表
product ['prɔdəkt] *n.* 产品
verify ['verifai] *v.* 証明
explain [eks'plein] *v.* 說明
thorium ['θɔ:riəm] *n.* 釷
starting ['sta:tiŋ] **point** 出发点
row [rou] *n.* 行
star [sta:] *n.* 星
mark [ma:k] *v.* 标志
occupy ['ɔkju:pai] *v.* 占
nucleus ['nju:kliəs] *n. sing.* 原子核
shoot [ʃu:t] *v.* (**shot, shot** [ʃɔt]) 射
loss [lɔs] *n.* 丧失
net [net] *a.* 淨
decrease [di'kri:z] *v.* 減少
nuclear ['nju:kliə] *a.* 核的
parent ['peərənt] *n.* 父母亲，前身
illustrate ['iləstreit] *v.* 以例說明
dispute [dis'pju:t] *n.* 爭辯
accuracy ['ækjurəsi] *n.* 精确
spontaneously [spɔn'teinjəsli] *adv.* 自然地
nuclei ['nju:kliai] *n.pl.* 原子核
rearrange ['ri:ə'reindʒ] *v.* 重排列
end-product 最后产品
detect [di'tekt] *v.* 发現，检驗出
determination [diˌtə:mi'neiʃən] *n.* 决定，测定

詞　組

to break up 分裂
to be attended by 为...所伴随；伴随有
no longer 不再
to be established 被确定
beyond doubt 无疑
in the next place 其次
to be isotopic with 与...是同位素
beyond dispute 无疑
thanks to 由于

課文注釋

1. It will be noted that in group 4, there are 3 elements which are isotopes of ordinary lead. 本句是主从复合句. **It** will be noted 是主句, It 是語法上的主語，眞正的主語是由連接詞 that 引出的主語从句. which ... lead 是定語从句，修飾 elements. 本句譯文: "可以注意到，在第四組中有三个元素，是普通鉛的同位素."
2. Thus, when a radioactive element disintegrates, either an electron (a beta particle) is shot from within the nucleus of a doubly charged helium atom (an alpha particle) from the same source; or both changes may occur. 在这复合句中，最后句 both changes may occur 和前面的一大句是并列的，而前面一句本身又是并列复合句，其中 either ... the nucleus 及 a doubly ... the same source 是并列的. when a radioactive element disin-

tegrates 是状語从句，修飾 is shot，說明时間．还应注意，在 or a doubly charged helium atom (an alpha particle) from the same source 中的謂語动詞 is shot 已省略，以免重复．本句譯文："因此，当一种放射性元素分裂的时候，或者有一个电子（β 质点）从核內射出，或者有一个带双倍电荷的氦原子（α 质点）从同一处射出；也有两种变化都发生的."

3. The results are nevertheless beyond dispute, thanks to the accuracy of the physical methods of measuring the characteristics of the electrons and alpha particles shot off from these spontaneously exploding nuclei. 本句是一个单句，其主語是 the results，謂語是 are beyond dispute. thanks to 意思是 "由于"，用作前置詞．thanks to the accuracy 修飾謂語 are beyond disputes，說明原因；of the physical methods 修飾 accuracy；of measuring (动名詞) the characteristics 修飾 methods；of the electrons and alpha particles 修飾 characteristics；shot off 是过去分詞短語作定語，修飾 electrons 及 particles 的；from these spontaneously exploding nuclei 作状語，修飾 shot off．在把这类有一系列 of 的句子譯成汉語时一般从后面开始．本句譯文："但由于原子核自行爆裂时所射出的电子及 α 质点的特性能用精确的物理方法測知，所以其結果是无可爭辯的."

4. The chemical properties of a certain element which depend on the arrangement of these electrons (particularly the outer, or valence electrons) are the same whether the element be formed as a result of radioactive change or not. 本句是主从复合句．主句是 The chemical properties of a certain element are the same. which 至 these electrons 是定語从句，修飾 properties. 括号中的 particularly the outer, or valence electrons 用来說明 electrons. whether 至句末是让步状語从句，修飾謂語 are the same 的；而这从句本身又是并列的，其完全的形式是 whether the element be formed as a result of radioactive change or the element be formed not as a result of radioactive change. 注意：be formed 中的 be 相当于 is，因为在这里有虛拟的意味，所以用动詞原形 be，而不用 is. 本句譯文："某一元素的取决于电子（尤其是外层电子，即价电子）的排列方式的化学性质是相同的，无論該元素是否由于放射性蛻变而形成."

3. RADIOACTIVITY AND TRANSMUTATION OF ELEMENTS (III)

Radioactive changes establish the fact that certain atoms can break down and form new elements, helium atoms, and electrons. If the nucleus of the atom is involved in these changes, the nucleus itself must be a complicated structure. It is now believed that the nuclei of all atoms are built out of protons and neutrons. In radioactive changes one would