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CHEMISTRY ENGLISH

化学专业英语

（第4版）

马永祥　孙晓君　编

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CHEMISTRY
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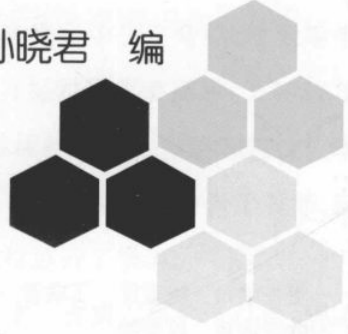

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前言

在科技英语词汇中，涉及化学和化工领域的词汇数量最大，从事这一专业工作的技术人员在掌握专业英语时，面对的词汇量数以万计，因而使该领域人员在学习专业英语时遇到的困难最大、周期最长，为使化学、化工专业学生缩短掌握专业英语的周期和在学习中少走弯路，收到事半功倍的效果，我们于1983年选编了此教材，并经过数年使用后，于1987年由兰州大学出版社正式出版发行，发行后陆续被国内许多高等院校化学及其相关专业选作高年级教学用书，一些从事化学工作的中青年教师、出国人员、科研和工程技术人员也作为自学教材进行了学习。

本书已修订多次，累计印书达十几万册。在第二版的修订中，删减了部分无机化学、有机化学的课文，增加了一些物理化学、结构化学的内容。

第三版修订又增加了三课新内容（组合化、离子液、杂环化学）和常用的三个附录（常用有机化合物英文缩写、常用分析测试仪器中英文名对照、美国《化学文摘》中常用词缩写），修订了一些印刷错误和改进了编辑中的缺陷。

此次修订，首先对本书的装帧做了全新的改变；其次，我们融合新媒体平台，首次采用二维码链接数字资源的形式，读者扫码即可免费获取配套学习资源，即全文朗读、参考译文、课后练习与答案，以及延伸阅读文章；再者订正了前版的印刷错误和修订了编辑中的不准确内容。经过此次修订，使本教材内容更加充实、更具时代性、印刷质量更高，也更符合当下数字阅读的需求，必将使广大读者更为满意。

本书共40课，内容涉及无机化学（元素及周期表、命名、配合物、酸碱

概念等),有机化学(命名、有机合成、金属有机、聚合物等),物理化学(热力学、动力学、结构化学等),化工基础(结晶、蒸馏、物料衡算),化学文献等,并附有化学实验室常用仪器、杂环化合物的命名等5篇附录,最后附有常用词组、词头和词尾的索引,以及总词汇表。

本书内容丰富,取材新颖,领域广泛,文体各异,句型繁多,词汇量大,并且均有注音和一些构词规律,对一些语法现象也进行了解释和概括。熟读本书不仅可以熟练地阅读本专业英语资料,且能用英语撰写稿件和进行国际学术交流。

在本次修订过程中,兰州大学外籍教师Nielsen James Walter承担了全部课文的朗读工作,兰州大学化学化工学院李敏、范兆麟两位同学参与了部分校对工作,在此对他们的辛勤付出一并表示衷心的感谢。

由于我们水平有限,虽经多次修订和完善,仍难免有不足之处和错误,盼望读者提出宝贵意见。

编者

2019年6月

目录

Lesson 1
THE ELEMENTS AND THE PERIODIC TABLE


全文朗读
参考译文

The number of protons in the nucleus of an atom is referred to as the atomic number, or proton number, Z. The number of electrons in an electrically neutral atom is also equal to the atomic number, Z. The total mass of an atom is determined very nearly by the total number of protons and neutrons in its nucleus. This total is called the mass number, A. The number of neutrons in an atom, the neutron number, is given by the quantity A-Z.

The term element refers to a pure substance with atoms all of a single kind. To the chemist the "kind" of atom is specified by its atomic number, since this is the property that determines its chemical behavior. At present all the atoms from Z=1 to Z=107 are known: there are 107 chemical elements. Each chemical element has been given a name and a distinctive symbol. For most elements the symbol is simply the abbreviated form of the English name consisting of one or two letters, for example:

oxygen=O nitrogen=N neon=Ne magnesium=Mg

Some elements, which have been known for a long time, have symbols based on their Latin names, for example:

iron=Fe(ferrum)copper=Cu(cuprum)lead=Pb(plumbum)

A complete listing of the elements may be found in Table 1.

Beginning in the late seventeenth century with the work of Robert Boyle, who proposed the presently accepted concept of an element, numerous investigations produced a considerable knowledge of the properties of elements and their compounds1. In 1869, D. Mendeleev and L. Meyer, working independently, proposed the periodic law. In modern form, the law states that the properties of the elements are periodic functions of their atomic numbers. In other words, when the elements are listed in order of increasing atomic number, elements having closely similar properties will fall at definite intervals along the list. Thus it is possible to arrange the list of elements in tabular form with elements having similar properties placed in vertical columns[2]. Such an arrangement is called a periodic table.

Each horizontal row of elements constitutes a period. It should be noted that the lengths of the periods vary. There is a very short period containing only 2 elements, followed by two short periods of 8 elements each, and then two long periods of 18 elements each3. The next period includes 32 elements, and the last period is apparently incomplete. With this arrangement, elements in the same vertical column have similar characteristics. These columns constitute the chemical families or groups. The groups headed by the members of the two 8-element periods are designated as main group elements, and the members of the other groups are called transition or

inner transition elements.

In the periodic table, a heavy stepped line divides the elements into metals and nonmetals. Elements to the left of this line (with the exception of hydrogen) are metals, while those to the right are nonmetals. This division is for convenience only; elements bordering the line - - the metalloids - have properties characteristic of both metals and nonmetals. It may be seen that most of the elements, including all the transition and inner transition elements, are metals.

Except for hydrogen, a gas, the elements of group ⅠA make up the alkali metal family. They are very reactive metals, and they are never found in the elemental state in nature. However, their compounds are widespread. All the members of the alkali metal family form ions having a charge of 1^+ only. In contrast, the elements of group IB – copper, silver, and gold – are comparatively inert. They are similar to the alkali metals in that they exist as 1^+ ions in many of their compounds. However, as is characteristic of most transition elements, they form ions having other charges as well4.

The elements of group ⅡA are known as the alkaline earth metals. Their characteristic ionic charge is 2^+. These metals, particularly the last two members of the group, are almost as reactive as the alkali metals. The group ⅡB elements – zinc, cadmium, and mercury are less reactive than are those of group ⅡA5, but are more reactive than the neighboring elements of group ⅠB. The characteristic charge on their ions is also 2^+.

With the exception of boron, group ⅢA elements are also fairly reactive metals. Aluminum appears to be inert toward reaction with air, but this behavior stems from the fact that the metal forms a thin , invisible film of aluminum oxide on the surface, which protects the bulk of the metal from further oxidation. The metals of group ⅢA form ions of 3^+ charge. Group ⅢB consists of the metals scandium, yttrium, lanthanum, and actinium.

Group ⅣA consists of a nonmetal, carbon, two metalloids, silicon and germanium, and two metals, tin and lead. Each of these elements forms some compounds with formulas which indicate that four other atoms are present per group ⅣA atom, as, for example, carbon tetrachloride, CCl4. The group ⅣB metals–titanium, zirconium, and hafnium – also form compounds in which each group ⅣB atom is combined with four other atoms; these compounds are nonelectrolytes when pure.

The elements of group ⅤA include three nonmetals – nitrogen, phosphorus, and arsenic – and two metals – antimony and bismuth. Although compounds with the formulas N_2O_5, PCl_5, and $AsCl_5$ exist, none of them is ionic. These elements do form compounds–nitrides, phosphides, and arsenides–in which ions having charges of minus three occur. The elements of group ⅤB are all metals. These elements form such a variety of different compounds that their characteristics are not easily generalized.

With the exception of polonium, the elements of group ⅥA are typical nonmetals. They are sometimes known as the chalcogens, from the Greek word meaning "ash formers". In their binary compounds with metals they exist as ions having a charge of 2^-. The elements of group ⅦA are all nonmetals and are known as the halogens, from the Greek term meaning "salt formers". They

are the most reactive nonmetals and are capable of reacting with practically all the metals and with most nonmetals, including each other.

The elements of groups ⅥB, ⅦB, and ⅧB are all metals. They form such a wide variety of compounds that it is not practical at this point to present any examples as being typical of the behavior of the respective groups[6].

The periodicity of chemical behavior is illustrated by the fact that, excluding the first period, each period begins with a very reactive metal. Successive elements along the period show decreasing metallic character, eventually becoming nonmetals, and finally, in group ⅦA, a very reactive nonmetal is found. Each period ends with a member of the noble gas family.

New words and Expressions

element['elimənt] *n.* 元素
proton['prəutɔn] *n.* 质子
nucleus['nju:kləs]复 nuclei ['nju:kliai] *n.* 核
atomic[ə'tɔmik] *a.* 原子的
atomic number 原子序数
neutral['nju:trəl] *a.* 中性的
mass[mæs] *n.* 质量
mass number 质量数
atom['ætəm] *n.* 原子
neutron['nju:trɔn] *n.* 中子
single kind 同一类
chemical ['kemikəl] *a.* 化学的
n. 化学品
symbol['simbəl] *n.* 符号
accept[ək'sept] *vt.* 接受，承认
concept[kɔnsept] *n.* 概念
compound[kəm'paund] *n.* 化合物
property['prɔpəti] *n.* 性质，特性
periodic[piəri'ɔdik] *a.* 周期的
periodic table 周期表
periodic law 周期律
state[steit] *vt.* 说明，认为
function['fʌŋkʃən] *n.* 官能；函数
tabular['tæbjulə] *a.* 表的
vertical['və:tikəl] *a.* 竖的，垂直的
column['kɔləm] *n.* 柱，塔；纵列
horizontal[hɔri'zɔntl] *a.* 水平的；横式的
row[rou] *n.* 排，横列
period['piəriəd] *n.* 周期
family['fæmili] *n.*（周期表的）族
group[gru:p] *n.* 族，基，团
vt. 把……分成组
transition[træn'ziʃən] *n.* 过渡，转变
metalloid['metəlɔid] *n.* 准金属
characteristic[kæriktə'ristik] *n.a.* 特性，特点
alkali['ælkəlai] *n.* 碱
alkali metal 碱金属
reactive[ri'æktiv] *a.* 活泼的，反应的
inert[i'nə:t] *a.* 惰性的，不活泼的
coinage['kɔinidʒ] *n.* 造币，货币
ionic[ai'ɔnik] *a.* 离子的
alkaline['ælkəlain] *a.* 碱的
alkaline earth metal 碱土金属
thin[θin] *a.* 薄的，稀薄的；*n.* 薄层
invisible[in'vizəbl] *a.* 肉眼看不见的
film[film] *n.* 膜，胶片
aluminum oxide 氧化铝
surface['sə:fis] *n.a.* 表面
formula['fɔ:mjulə] *n.* 分子式，公式
oxidation[ɔksi'deiʃən] *n.* 氧化

carbon tetrachloride 四氯化碳
combine[kəm'bain] *v.* 化合,结合(with)
non-electrolyte['nɔn-i'lektrəlait] *n.* 非电解质
nitride['naitraid] *n.* 氮化物
phosphide['fɔsfaid] *n.* 磷化物
arsenide['ɑ:sinaid] *n.* 砷化物
chalcogen['kælkədʒən] *n.* 硫属,硫族
ash former[æʃ'fɔ:mə]灰源体,成灰(者)
binary ['bainəri] *a.n.* 二元(的),双(的)
halogen['hælədʒən] *n.* 卤素
salt former[sɔ:lt'fɔ:mə]盐源体,成盐(者)
periodicity[piəriə'disiti] *n.* 周期性

前 缀

in-[in-](il-,im-,ir-)不,无,非
incomplete, inorganic, invisible, impure, irregular
non-[nɔn-]非,不,无
nonmetal, nonelectrolyte, noninflammable (不燃的), nontoxic(无毒的)
di-[dai-]二,双,联,重,偶
dipositive, dioxide; dimolecular, diatomic, diphenyl(联苯), dibenzoyl(联苯甲酰), dichromate(重铬酸盐), dipole(偶极)

后 缀

-on[-ɔn,-ən](名词词尾)
①组成原子微粒
proton, neutron, ion, electron
②非金属元素词尾
argon, boron, carbon, silicon
-ic[-ik](形容词词尾)
ionic, periodic, atomic, catalytic
-ide[-aid]…化物(名词词尾)
oxide, chloride, hydride, halide, nitride

词 组

referred to as… 称为……,被认为是……
equal to… 等于,与……相等
refer to… 涉及,指的是
(be)abbreviated form… 是……的缩写,是……之略
consist of… 由……组成
(be) based (up)on… 根据……,以……为准
begin with… 从……开始
in modern form 按近代方式
a function of 随……而变,…的函数
in other words 换句话说
in order of… 按……(排列)
followed by… 接着,继之有,后面是
main group element 主族元素
for convenience 为方便起见
divide A into B and C 把A分成B和C
with the exception of… 除……之外
except for… 除……之外
make up… 形成,组成
in contrast 相反,与此对比
similar to… 类似于
exist as… 以[……形式]存在
…as well [同样]也
known as 就是通常说的……,以……著称
protect A from B 保护A不受B…[影响];使A免于B
composed of… 由……组成
to some extent 在某种程度上
a variety of… 各种各样的
capable of (+ing) 能够……,有……可能

odic Table

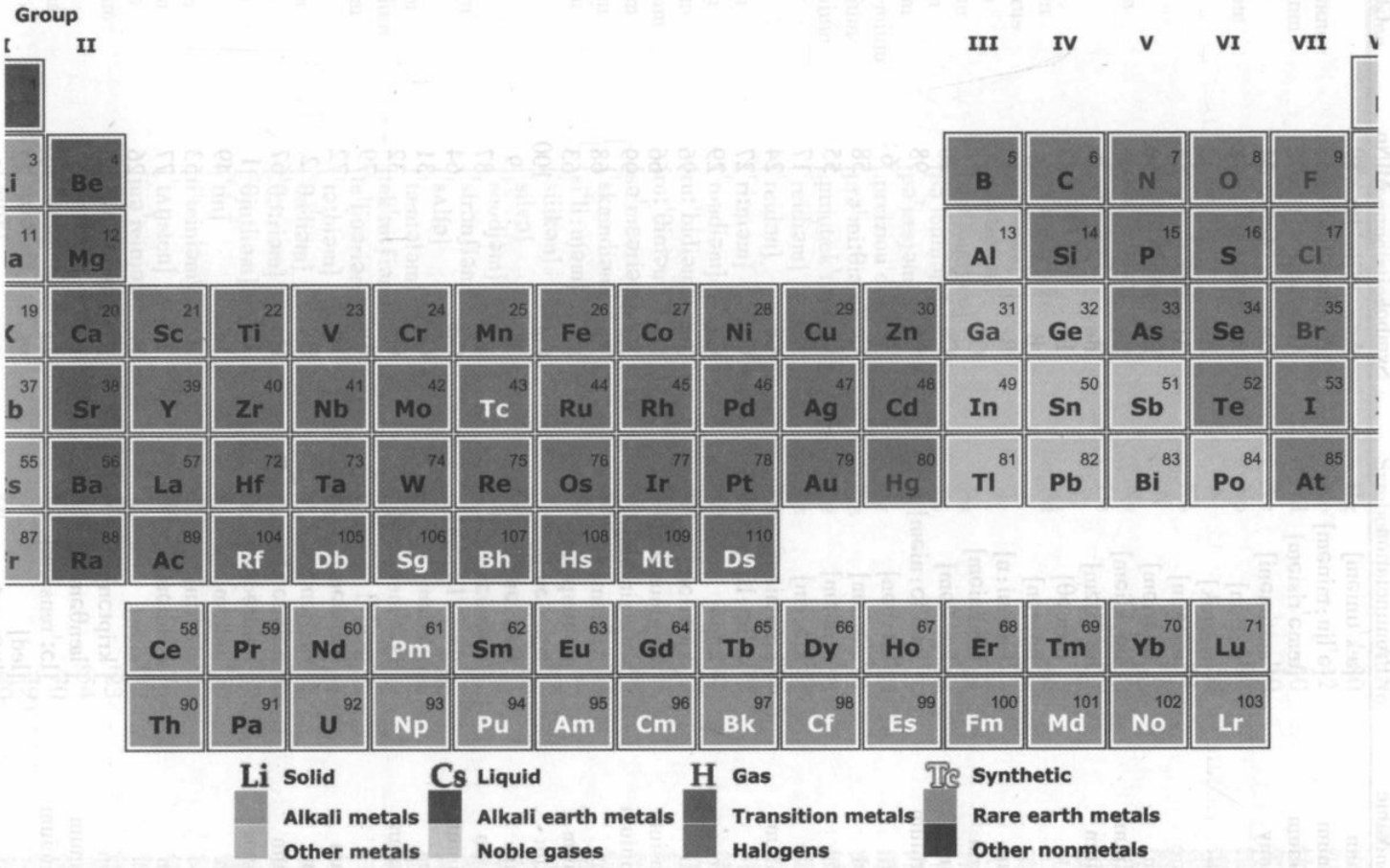
Group
I
II
III
IV
V
VI
VII
V
1
3 Li
4 Be
5 B
6 C
7 N
8 O
9 F
11 Na
12 Mg
13 Al
14 Si
15 P
16 S
17 Cl
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br
37 Rb
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
55 Cs
56 Ba
57 La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
87 Fr
88 Ra
89 Ac
104 Rf
105 Db
106 Sg
107 Bh
108 Hs
109 Mt
110 Ds
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr
Li Solid
Alkali metals
Other metals
Cs Liquid
Alkali earth metals
Noble gases
H Gas
Transition metals
Halogens
Tc Synthetic
Rare earth metals
Other nonmetals

Table 1 IUPAC* Names and Symbols of the Elements

Name	Pronunciation	Symbol	At.No.	Chinese
Actinium	[æk'tiniəm]	Ac	89	锕
Aluminum	[ə'lju:minəm]	Al	13	铝
Americium	[æmə'risiəm]	Am	95	镅
Antimony	['æntiməni]	Sb	51	锑
Argon	['ɑ:gɔn]	Ar	18	氩
Arsenic	['ɑ:snik]	As	33	砷
Astatine	['æstətin]	At	85	砹
Barium	['bɛəriəm]	Ba	56	钡
Berkelium	['bə:kliəm]	Bk	97	锫
Beryllium	[be'riljəm]	Be	4	铍
Bismuth	['bizməθ]	Bi	83	铋
Boron	['bɔ:rɔn]	B	5	硼
Bromine	['broumi:n]	Br	35	溴
Cadmiun	['kædmiəm]	Cd	48	镉
Calcium	['kælsiəm]	Ca	20	钙
Californium	['kæli'fɔ:niəm]	Cf	98	锎
Carbon	['kɑ:bən]	C	6	碳
Cerium	['siəriəm]	Ce	58	铈
Cesium	['si:ziəm]	Cs	55	铯
Chlorine	['klɔ:rin]	Cl	17	氯
Chromium	['kroumiəm]	Cr	24	铬
Cobalt	[kə'bɔ:lt]	Co	27	钴
Copper	['kɔpə]	Cu	29	铜
Curium	['kjuəriəm]	Cm	96	锔
Dysprosium	[dis'prousiəm]	Dy	66	镝
Einsteinium	[ain'stainiəm]	Es	99	锿
Erbium	['ə:biəm]	Er	68	铒
Europium	[juə'roupiəm]	Eu	63	铕
Fermium	['fɛəmiəm]	Fm	100	镄
Fluorine	['flu(:)ərin]	F	9	氟
Francium	['frænsiəm]	Fr	87	钫
Gadolinium	[ˌgædə'liniəm]	Gd	64	钆
Gallium	['gæliəm]	Ga	31	镓
Germanium	[dʒə:'meiniəm]	Ge	32	锗
Gold	['gould]	Au	79	金
Hafnium	['hæfniəm]	Hf	72	铪
Helium	['hi:ljəm]	He	2	氦
Holmium	['hɔlmiəm]	Ho	67	钬
Hydrogen	['haidrədʒən]	H	1	氢
Indium	['indiəm]	In	49	铟
Iodine	['aiədi:n]	I	53	碘
Iridium	[ai'ridiəm]	Ir	77	铱
Iron	['aiən]	Fe	26	铁
Krypton	['kriptɔn]	Kr	36	氪
Lanthanum	['lænθənəm]	La	57	镧
Lawrencium	[lɔ:'rensiəm]	Lr	103	铹
Lead	[led]	Pb	82	铅
Lithium	['liθiəm]	Li	3	锂
Lutetium	[lju:'ti:ʃiəm]	Lu	71	镥
Magnesium	[mæg'ni:ziəm]	Mg	12	镁
Manganese	['mæŋgəni:z]	Mn	25	锰
Mendelevium	[ˌmendə'liviəm]	Md	101	钔

续表

Name	Pronunciation	Symbol	At.No.	Chinese
Mercury	[ˈməːkjuri]	Hg	80	汞
Molybdenum	[məˈlibdiːnəm]	Mo	42	钼
Neodymium	[ˌni(ː)əˈdimiəm]	Nd	60	钕
Neon	[ˌniːən]	Ne	10	氖
Neptunium	[nepˈtjuniəm]	Np	93	镎
Nickel	[ˈnikəl]	Ni	28	镍
Niobium	[naiˈoubiəm]	Nb	41	铌
Nitrogen	[ˈnaitridʒən]	N	7	氮
Nobelium	[nouˈbeliəm]	No	102	锘
Osmium	[ˈɔzmiəm]	Os	76	锇
Oxygen	[ˈɔksidʒən]	O	8	氧
Palladium	[pəˈleidiəm]	Pd	46	钯
Phosphorus	[ˈfɔsfərəs]	P	15	磷
Platinum	[ˈplætinəm]	Pt	78	铂
Plutonium	[pluːˈtounjəm]	Pu	94	钚
Polonium	[pəˈlouniəm]	Po	84	钋
Potassium	[pəˈtæsjəm]	K	19	钾
Praseodymium	[ˌpreiziouˈdimiəm]	Pr	59	镨
Promethium	[prəˈmiːθiəm]	Pm	61	钷
Protactinium	[ˌproutækˈtiniəm]	Pa	91	镤
Radium	[ˈreidiəm]	Ra	88	镭
Radon	[ˈreidɔn]	Rn	86	氡
Rhenium	[ˈriːniəm]	Re	75	铼
Rhodium	[ˈroudiəm]	Rh	45	铑
Rubidium	[ruːˈbidiəm]	Rb	37	铷
Ruthenium	[ruːˈθiniəm]	Ru	44	钌
Samarium	[səˈmɛəriəm]	Sm	62	钐
Scandium	[ˈskændiəm]	Sc	21	钪
Selenium	[siˈliːnjəm]	Se	34	硒
Silicon	[ˈsilikən]	Si	14	硅
Silver	[ˈsilvə]	Ag	47	银
Sodium	[ˈsoudjəm]	Na	11	钠
Strontium	[ˈstrɔnʃiəm]	Sr	38	锶
Sulfur	[ˈsʌlfə]	S	16	硫
Tantalum	[ˈtæntələm]	Ta	73	钽
Technetium	[tekˈniːʃiəm]	Tc	43	锝
Tellurium	[teˈljuəriəm]	Te	52	碲
Terbium	[ˈtəːbiəm]	Tb	65	铽
Thallium	[ˈθæliəm]	Tl	81	铊
Thorium	[ˈθɔːriəm]	Th	90	钍
Thulium	[ˈθjuːliəm]	Tm	69	铥
Tin	[ˈtin]	Sn	50	锡
Titanium	[tiˈteiniəm]	Ti	22	钛
Tungsten	[ˈtʌŋsten]	W	74	钨
Uranium	[juəˈreinjəm]	U	92	铀
Vanadium	[vəˈneidiəm]	V	23	钒
Xenon	[ˈzenɔn]	Xe	54	氙
Ytterbium	[iˈtəːbjəm]	Yb	70	镱
Yttrium	[ˈitriəm]	Y	39	钇
Zinc	[ˈziŋk]	Zn	30	锌
Zirconium	[zəːˈkouniəm]	Zr	40	锆

*IUPAC是International Union of Pure and Applied Chemistry，即："国际纯粹化学和应用化学联合会"的缩写。