英　语

下　册

（分析化学专业用）

张勤超　邱启凡　合编

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编 者 说 明

本书系分析化学专业英语教材的下册。全册共 12 课，每课附有阅读材料，共出现生词和词组约 900 个，授课时数约 60 学时。

本册内容紧接中册仪器分析部分中的电分析法，开始为光分析法（如比色、紫外、红外、发射光谱及原子吸收等），其他分析法（如色谱、离子交换、质谱及萃取等），还有有机试剂，计算机在分析化学中的应用（包括核磁共振），最后是美国化学文摘（CA）简介。课文与阅读材料皆选自分析化学原版书刊，但为了使每课的生词不超过一定的数量，以及每课的课文长短适中，因而作了适当的改写和删节。

本册编写的目的，是使研究所、厂矿和地质勘探队分析专业人员英语学习班以及大专院校分析专业的学生，通过学习上述专业内容，扩大专业英语词汇量及其应用，进一步巩固上、中册所学过的语法，而重点放在英语科技文献的翻译技巧上，因此，在课文注释中，除了对比较少见的语法现象加以注解外，主要结合实例讲述翻译方法。为了使读者对于英译汉翻译方法有一比较全面的理解，本册附录 I 是“英译汉翻译技巧”以供参考。附录 II 是“化学常用英语略语表”，主要选自美国化学文摘（CA），以便读者查阅文献。

本册共有三个练习，每四课一个，主要采用 The English Proficiency Test（EPT）形式。第一个练习的语法部分重点是复习时态、语态及形容词、副词比较级，第二个练习的语法

部分是复习非谓语动词，第三个练习是复习句法等。三个练习的词汇部分都是分析专业常用词汇的应用；阅读理解部分是对课外阅读理解程度的测试。因为本册的重点是解决翻译问题，所以把综合测试（Cloze Test）改用几篇短文作为翻译练习。

湖南大学化学化工系俞汝勤教授，北京大学宫宜文副教授审阅了本书，谨此表示谢意。

由于我们的水平有限，教材中一定存在不少缺点和错误，衷心地希望批评指正。

编　者

1983 年 11 月

Contents

Lesson One

Colorimetry

Modern colorimetry may be regarded as a specialized branch of absorption spectrophotometry. Thus the material to be estimated — whether it be an atom, ion, functional group or molecule — is converted quantitatively into a coloured species that obeys Beer's law in solution. The extinction of the solution is measured at an appropriate wavelength, thus giving a measure of concentration; and, provided the molar absorptivity (extinction coefficient) is known, or a calibration graph has been plotted, the quantity of material responsible for the colour can be determined. [1]

The term "colorimetry", however, is applied to a number of related techniques, and perhaps the scope of the method may be appreciated by surveying briefly the development of the subject. The early form of colorimetry did not involve true measurement of colour, but rather the comparison of a coloured test solution with a matched solution of known concentration. An example is the trace analysis of manganese

in ores. The ore is dissolved, made up to a definite volume, and an aliquot oxidized to permanganate. The permanganate is made up to a definite volume, perhaps 50 ml, in a Nessler tube, and is placed by the side of a matching tube on a white back-ground. Permanganate of known concentration is added, drop by drop from a microburette, with stirring, to the matching tube containing 50 ml of "blank" solution, until the colour intensities of both solutions appear on visual examination to be identical.[2] Since the concentration of permanganate in the "blank" tube is known, and is equal to that in the test solution, the amount of manganese in the sample can be determined.

Such a method of visual comparison of colours may be accurate to within ± 10% of the true value, and may be adequate for many trace analyses. Thus, in the analysis of an iron ore containing about 0.1% of manganese, the analysis of major constituents is not very accurate in the second place of decimals, and it may not be important to distinguish between 0.10% and 0.11% manganese. For such estimations, visual colorimetry is still useful inasmuch as it affords a simple method of analysis, not requiring expensive apparatus.

Another method of visual colorimetry, though it is old and has been seldom used, may be introduced

here only for reference. In this inexpensive instrument, test sample and "blank" solutions are placed side by side in cells or tubes of the same dimensions. For any particular analysis, standard coloured glasses are provided of the identical colour to that produced in the analysis, but graded in intensity.[3] These glasses are ranged round the periphery of a disk which is rotated in front of (or above) the "blank" solution, until the colour intensity appears the same as that in the test solution. These standard disks are graded in terms of concentration, and the concentration of the test solution can therefore be estimated. Most colorimetric analyses may be performed by this method provided that a standard disk is available commercially.[4] Such a method is useful in laboratories performing routine analysis; but where a wide variety of colorimetric analyses is required, it is obviously impractical to acquire a large number of standard disks, even if they are available.

With the appearance of photoelectric absorptiometers, however, the emphasis in more accurate colorimetric analysis has shifted from comparative methods to direct measurement of colour as absorbance (optical density). Provided that Beer's law is obeyed under the conditions of analysis, absorbance is proportional to concentration, and can be measured to a precision of less than 2%, with a possible error of

only ± 1% in the optimum range of absorbance between 0.2 and 0.8.

The direct measurement of colour in terms of absorbance may be termed "absorptiometry" as a more general term than "colorimetry". However, absorptiometry includes also such methods as turbidimetry which will not be discussed here. In addition, absorptiometry may be performed using a source of light that is not, strictly, monochromatic. Thus, most of the earlier colorimetric analyses were performed in photoelectric absorptiometers in which the source of light was modified by the insertion of a suitable colour filter. Such instruments are still in current use, and are likely to retain their place in analysis by virtue of their relative cheapness. However, a filter usually transmits a fairly wide wavelength band, which is not always suitable for colorimetry based on Beer's law. It is far preferable to use a spectrophotometer, in which the wavelength can be selected accurately.

New Words & Expressions

1. specialize ['speʃəlaiz] *v.* 专门研究, 专业化
2. spectrophotometry [spektrəufə'tɔmitri] *n.* 分光光度(测定)法
   spectrophotometer [spektrəufə'tɔmi:tə] *n.* 分光光度计
3. functional ['fʌŋkʃənl] *a.* *a.* 官能的, 作用的
4. absorbance [əb'sɔ:bəns] *n.* 吸光度, 吸收率

absorptivity [əbsɔ:p'tiviti] *n.* 吸光系数

5. extinction [iks'tiŋkʃən] *n.* 吸光度, 消光(度)
6. length [leŋθ] *n.* 长, 长度
7. coefficient [kəui'fiʃənt] *n.* 系数, 效率
8. responsible [ris'pɔnsəbl] *a.* 有责任的, 可靠的
9. appreciate [ə'pri:ʃieit] *vt.* 鉴定, 评价; 欣赏
10. survey [sə'vei] *vt.*, ['sə:vei] *n.* 观察, 调查, 勘测
11. manganese [mæŋgə'ni:z] *n.* 锰 (Mn)
    manganate ['mæŋgəneit] *n.* 锰酸盐
    permanganate *n.* 高锰酸盐
12. background ['bækgraund] *n.* 背景, 背地, 本底
13. microburette [maikrəubju'ret] 微量滴定管
14. adequate ['ædikwit] *a.* 足够的, 充分的, 适当的
15. inasmuch [inəz'mʌtʃ] *adv.* (与 as 连用, 起连接作用)因为, 由于
16. afford [ə'fɔ:d] *vt.* 供应, 供给
17. simplify ['simplifai] *vt.* 简化, 精简
18. grade *n.* 等级, 级别
    vt. 分类; 分级
19. periphery [pə'rifəri] *n.* 周边, 周围, 外围
20. routine [ru:'tin] *n.* 例行程序, 日常工作;
    a. 例行的, 常规的
21. acquire [ə'kwaiə] *vt.* 获得, 得到
22. photoelectric (al) [fəutəui'lektrikəl] *a.* 光电的
23. absorptiometer [əbsɔ:pʃi'ɔmitə] *n.* 吸光计, 光度计
    absorptiometry [əbsɔ:pʃi'ɔmitri] *n.* 吸收(光度)测定法
24. emphasis ['emfəsis] (pl. emphases) *n.* 强调; 显著; 重要性
25. shift [ʃift] *v.*, *n.* 转换, 改换; 变速; 转移
26. comparative [kəm'pærətiv] *a.* 比较的, 相当的
27. optimum ['ɔptiməm] *a.*, *n.* 最佳(的), 最适应(的), 最恰当的

28. turbidimetry[tə:bi'dimitri] *n.* 比浊法, 浊度测定法
29. monochromatic [mənəkrə'mætik] *a.* 单色的, 单色光的
30. insertion [in'sə:ʃən] *n.* 插入, 插放; 插入物
31. likely ['laikli] *a.* 很可能的, 大概会的; *adv.* 可能, 大概
32. retain [ri'tein] *vt.* 保持(不动, 不变), 维持, 留住
33. virtue ['və:tju:] *n.* 优点, 美德; 功效
34. cheap ['tʃi:p] *a.* 廉价的, 便宜的
cheapness *n.* 廉价, 便宜
35. transmit [trans'mit] *v.* 传送, 发射, 透光
36. band [bænd] *n.* 带, 光带

be regarded as 被认为是
absorption spectrophotometry 吸收分光光度(测定)法
Beer's law 比尔定律
wavelength 波长
molar absorptivity 摩尔吸光系数
be responsible for 对……负责; 造成, 导致
matched solution 匹配溶液
make up 配制, 冲制
Nessler tube 奈斯勒比色管 奈氏比色管
blank solution 空白溶液
trace analyses 痕量分析
in front of 在……的前面
by virtue of 由于, 根据, 凭借着

Notes

(1) The extinction of the solution is measured at an appropriate wavelength, thus giving a measure of concentration; and, provided the molar absorptivity (extinction coefficient) is known, or a calibration graph has been plotted, the quantity of material responsible for the colour can be determined.

在适当的波长处, 测量溶液的消光度, 这样就可以得到一个浓

度的量度，如果摩尔吸光系数是已知的，或已经绘制了工作曲线，产生颜色的物质的量，就可以测定出来。

provided 引出的是条件状语从句，可以用 if 代替，详见中册第 15 课 Amperometry 的注译 2。responsible for the colour 是形容词短语，在句中充当定语说明 material。此句是被动语态，译成汉语的无主语句。

(2) Permanganate of known concentration is added, drop by drop from a microburette, with stirring, to the matching tube containing 50 ml of "blank" solution, until the colour intensities of both solutions appear on visual examination to be identical.

用微量滴定管把已知浓度的高锰酸盐，在不断地搅动下，一滴一滴地加到盛有 50 ml "空白"溶液的匹配管试管中，直到目测两溶液的强度达到一致为止。

注意 drop by drop, with stirring 和 on visual examination 三个状语译成汉语后的位置，并注意 ... is added 后的介词 to（把…加到…）。to be identical 是不定式短语作 appear 的表语。

(3) For any particular analysis, standard coloured glasses are provided of the identical colour to that produced in the analysis, but graded in intensity.

对于任一特定分析，提供（一套）标准颜色系列玻璃片。这些玻璃（色）片的颜色与分析中产生的颜色要相同，但按强度区分为不同等级。

句中 of the identical colour ... intensity，是主语 glasses 的定语，因为这个定语过长，放在了谓语 are provided 之后。此句可采用分译法，把此定语译成并列句，前一分句的谓语由形容词 identical 充当，后一分句的谓语由分词 graded 充当（改变句子成分译法）。

(4) Most colorimetric analyses may be performed by this

method provided that a standard disk is available commercially.

如果在市面上能买到适用的标准片，用此法即可进行大多数的比色分析。

provided that 等于 provided 引出的条件状语从句。此句采用的是词义引伸意译法。

Reading Material

Methods of Colour Comparison*

For determination of the concentration of an unknown solution by comparison of its colour with a standard solution, the two solutions must be compared under identical conditions. Accordingly, the following procedures are adopted in colorimetric determinations.

1. The same reagents are added, in the same sequence and in the same quantities, to both the standard solution and the unknown solution.

2. The reactions with both solutions are performed simultaneously as very often the colour changes with time.

3. If the unknown solution contains extraneous ions which influence the colour, and their influence cannot be eliminated by any means, approximately

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* 此篇材料所叙述的一些操作方法虽然目前在分析实践中已很少应用，但有关文字较适合初学者作阅读练习，故选编于此；读者在阅读时也可了解到某些分析技术过去与现在的对比。

the same amounts of these ions are introduced into the standard solution. It is obvious that if the colour due to extraneous ions is too intense colorimetric determination may be impossible.

4. The colours of the unknown and standard solutions are compared in exactly similar vessels, made from the same kind of glass, and the two solutions must be illuminated equally. [1]

The eye is incapable of estimating quantitatively differences of colour intensities; therefore, in visual colorimetry the aim is to equalise the colours of the solutions compared.

If we know how the colours have been equalised, we can easily calculate the concentration of the unknown solution. The following methods of visual colorimetry are distinguished, in accordance with the method used for equalising the colours.

The Method of Standard Series. In this method not one standard solution is prepared but a series, with gradually increasing concentrations of the element to be determined. For example, in the determination of copper by this method, progressively increasing amounts of a standard $CuSO_4$ solutions are measured out into a series of similar test tubes, equal volumes of NH_4OH are added to each to convert the Cu^{++} ions into the more intensely coloured $[Cu(NH_3)_4]^{++}$ ions, and each is made up to the same volume (say,

20 ml) with water, This gives a colorimetric scale, which indicates the colours corresponding to different concentrations of copper in solution.

The unknown solution is similarly treated with NH_4OH solution and then diluted with water under exactly the same conditions. The colour is compared with the colours of the standard series.

If the solutions compared are placed under the same conditions, equal colours correspond to equal copper contents. For example, if it is found that the colour of the unknown solution is the same as that of a standard solution containing 4.0 mg of Cu^{++} in 20 ml, then this is also the copper content of 20 ml of the unknown solution. If the colour of the latter is more intense than with 4 mg of copper but weaker than with 4.5 mg, its Cu^{++} content may be taken as intermediate between the two, or approximately 4.25 mg per 20 ml.

Since in the method of standard series the concentrations of the unknown and standard solutions are equal to each other, this method can be used with substances which do not obey the Lambert-Beer law.[2] Its advantages are simplicity and speed. However, it is obvious that this is true only if numerous determinations have to be carried out. With single determinations the time required for preparation of the scale is not justified and this method is not convenient,