石油科技英语丛书
Petroleum Technical English Series

吴松林 江淑娟 编

石油化工英语

Petrochemical English

石油工业出版社
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前　　言

随着石油工程国际合作项目的日益增多，越来越多的石油工程科技人员需要提高英语交流水平，从而了解国际石油经济的新进展，成功地从事国际合作业务，参与国际竞争。但目前市场尚缺乏适于自学，且石油专业涵盖面较广的英语阅读教材。为此，我们编写了一套《石油科技英语丛书》，分为石油勘探英语、石油钻井英语、油田开发英语、石油化工英语和石油经济与管理英语五个分册。这五个分册基本涵盖了石油工业各方面的词汇和术语，每一分册原文均选自英语国家原版刊物，语言地道、准确，疑难语法现象及语言点均配以注释，阅读理解练习的设计科学、合理，有利于阅读理解能力的快速提高。此外，所有原文均配有准确流畅的译文，读者可借此进一步提高阅读理解的准确性，也可以通过翻译练习提高翻译能力。

有了这套教程，石油工作者就可以随时随地进行英语自学，尽快掌握本专业常用术语、词汇及表达法等，更顺利地进行对外合作业务。本教程编写过程中，广泛参阅了国际最新石油科技杂志和专著，选材具有新颖性和实用性，语言技能训练根据学习者的专业需要而有所侧重，适用对象范围广，可供石油、石化科技工作者使用，也可供大专院校师生等做 ESP（English for Specific Purposes/专门用途英语）教材或参考书使用，更值得作为资料情报馆藏。

本书在编写过程中，张玉林及梁祥民先生在资料的收集、整理等方面给予了大力协助。美籍专家 John Carey 夫妇及 Barry Wallace 先生为本书做了大量的审校工作。江山，孙峰，田野，陈晓梅等做了大量的文字录入和校对工作，在此一并衷心致谢。

由于作者水平有限，书中难免存在缺点和不足之处，诚望广大读者批评指正。

吴松林　江淑娟

2002 年 8 月

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1 Outline of Petrochemical Industry

1.1 The Nature of Organic Compounds

Some organic compounds have been known since earliest antiquity（古代）. Prehistoric peoples were familiar with sugar, with the fermentation (发酵) of the sweet principle of grape (sugar) and the production of wine, and with the souring of wine under the agency of Acetobacter (醋酸杆菌属) to produce vinegar, a dilute solution (稀释溶液) of acetic acid (乙酸)[1]. Vegetable oils and animal fats, and the process of making soap from these substances, have been known for centuries.

In contrast with (与…对比) most mineral substances, the organic compounds are as a rule（通常）easily combustible (易燃的), and often are destroyed or damaged by even moderate（适中的）application of heat. The tend to be delicate and sensitive, and certain of them resemble actual plant and animal tissues. Since all organic compounds known at the beginning of the 19th century had been isolated (分离) as products of the life process, the belief was current（流行）for a time that organic compounds could arise only through operation of a "vital force"（生命力）inherent in living cells.[2] Originally the term organic chemistry referred to the chemistry of materials derived from living things. However, repeated demonstration that compounds identical in all respects with those obtained from plants and animals could be prepared from mineral materials[3] showed that the synthetic preparation of organic compounds (有机化合物) presents no mystery and that the origin of a compound is not a reliable（可靠的）means for classification.

Most natural products now known have been prepared synthetically(用合成方法), and purely synthetic organic compounds exceed by far those found in nature. The designation organic (有机这个名称) has persisted for the convenient classification of a group of compounds having some features in common (共性). Some of them contain carbon and hydrogen, a large number contain oxygen as well, many contain nitrogen, and some contain halogen (卤素), sulfur, phosphorus (磷), and other elements. Since they all contain carbon, organic chemistry is perhaps best defined as (定义为) the chemistry of carbon-containing compounds.

Organic chemicals are put to (用于) many varied uses. They are worn as clothes, eaten as foods, and used as fuels. They include "wonder" drugs, vitamins, and hormones (激素) as well as deadly poisons. A large number of organic chemicals are used in agriculture as fertilizers, soil conditioners (土壤调节剂), and insecticides (杀虫剂). The best-known explosives are compounds of carbon.

The chief sources of organic materials are coal, petroleum, wood, and agricultural products. These are the fundamental raw materials upon which the organic chemical industry is built.

Notes

(1) a dilute…名词短语作同位语。

(2) that 从句作主语同位语。

(3) that 从句为主语同位语。其中，identical…animals 为形容词短语作后置定语。

Exercise

Directions: Decide whether the following statements are true or false.

1. The fact has been known for centuries that vegetable oils and animal fats, and the process of making soap source from these substances.

2. In contrast with most mineral substances, the organic compounds are never easily combustible.

3. Most natural products have been prepared synthetically, and purely synthetic organic compounds exceed by far those found in nature.

4. A large number of organic chemicals are used in agriculture as fertilizers, soil conditioners, and insecticides.

5. The chief sources of organic materials are the fundamental law materials upon which the organic chemical industry is built.

1.2 Evaporation

The objective (目的) of evaporation[1] is to concentrate a solution consisting of a nonvolatile[2] solute (不挥发的熔质) and a volatile solvent (挥发的溶剂). In the great majority of evaporations the solvent is water. Evaporation is conducted by vaporizing a portion of the solvent to produce a concentrated solution or thick liquor. Evaporation differs from drying in that[3] residue is a liquid (sometimes a highly viscous one) rather than a solid; it differs from distillation in that the vapor is usually a single component, and even when the vapor is a mixture, no attempt is made in the evaporation step to separate the vapor into fractions (馏分); it differs from crystallization (结晶) in that emphasis is placed on (着重于) concentrating a solution rather than forming and building crystals. In certain situations, e.g., in the evaporation of brine[4] to produce common salt[5], the lie (状态) between evaporation and crystallization is far from sharp (不明显). Evaporation sometimes produces a slurry of crystals (结晶淤浆) in a saturated mother liquor[6].

Normally, in evaporation the thick liquor is the valuable product and the vapor is condensed and discarded (扔掉). Mineral-bearing[7] water is often evaporated to give a solid-free product for boiler feed (锅炉加水), for special process requirements, or for human consumption. This technique is often called water distillation[8], but technically it is evaporation. Large-scale (大规模的) evaporation process is being developed and used for recovering potable water (提取饮用水) from sea water. Here the condensed water is the desired product. Only a fraction of the total water in the feed is recovered, and the remainder (剩余物) is discarded.

Notes

(1) evaporation 蒸发
(2) nonvolatile 不挥发的
(3) 介词宾语 that 后面接同位语从句。
(4) brine 用盐水泡处理;盐水
(5) to produce common salt 作后置定语，表示动作未发生。
(6) mother liquor 母液
(7) mineral-bearing 含矿的
(8) water distillation 水的蒸馏

Exercise

Directions: Decide whether the following statements are true or false.

1. The objective of evaporation is to concentrate a solution consisting of a nonvolatile solute and a volatile evaporation.

2. Evaporation is conducted by vaporizing a portion of the solvent to produce a water distillation.

3. Volatile solvent sometimes produces a slurry of crystals in a

saturated mother liquor.

4. In evaporation the thick liquor is the invaluable product and the vapor is condensed and discarded.

5. Large-scale evaporation process is being developed and used for recovering potable water from sea water.

1.3 Distillation

How do scientists separate the hydrocarbons (烃类)? They distil[1] the oil. They turn the oil into vapor and then turn the vapor into liquids.

The theory of distillation（蒸馏） is very easy. Most liquids boil when they reach a certain temperature. When crude oil boils, it sends out vapor and condenses. All the different hydrocarbons in crude oil are at different temperatures. And their vapors all make separate liquids. So, in order to separate the hydrocarbons, the scientists distill the crude oil. Because the hydrocarbons boil at different temperatures, their vapors must also condense at different temperatures. When the hydrocarbons boil, their vapors condenses separately. So the oil breaks down into (分离成) its fractions and forms different liquids.

The oil distilled in a very large steel tower, the technical name of which is the "fractionating tower (分馏塔)." The tower is thirty to fifty meters tall and its diameter is one to three meters. It is divided into "chambers," each of which contains a layer of trays (一层塔盘). There are holes in the trays. The vapors go through these holes and condense on the trays. The chambers are at different heights, and the temperature at each height is different. The temperature inside the tower is highest at the bottom, and it is lowest at the top. So each layer of trays is cooler than the layer below it. There are not enough chambers of different temperatures in one tower, so two or three towers are needed.

Beside the first tower there is very large furnace (炉子), the "pre-heater (预热炉)," where the temperature of the oil is raised to 340 degrees Centigrade(2). The boiling oil and vapors then flow from the furnace into the fractionating tower. They flow into a chamber near the bottom. Some of the oil with the heaviest hydrocarbons makes no vapor. This oil—the "residue" —drops to the bottom and flows out of the tower again. Later bitumen(3) and other heavy materials will be made from the residues. All the other hydrocarbons in the oil make vapors which float up the tower to different chambers.

When the vapors rise into the cooler part of the fractionating tower, they lose heat. The vapors rise until they are just below their own boiling temperature. Then they condense on a tray and turn into a liquid again. The liquid on each tray flows into a separate small tower where the liquid breaks down into smaller fractions. The separation of the hydrocarbons is then more accurate (精细). The distilled then flow through separate pipes into separate storage tanks(4).

Notes

(1) distil　蒸馏

(2) centigrade　摄氏

(3) bitumen　沥青

(4) storage tank　贮槽; 油罐

Exercise

Directions: Decide whether the following statements are true or false.

1. Scientists separate the hydrocarbons by distilling the oil that is turned into vapor and then liquids.

2. The boiling crude oil sends out vapor and condenses, all the different hydrocarbons in it being at different temperatures.

3. The oil distilled in a very large steel tower, the technical name of which is the 'distilling tower.'

4. Two or three towers are needed because there are not enough chambers of different temperatures in one tower.

5. The liquid breaks down into smaller fractions on each tray before flowing into a separate small tower.

1.4 Crystallization

Crystallization from liquid solution is important industrially because of the variety of materials that are marketed (销售) in the crystalline form(1). Its wide use is based on the fact that a crystal formed from an impure solution is itself pure (unless mixed crystals occur) and that crystallization affords a practical method of obtaining pure chemical substances in a satisfactory condition for package and storing.(2)

It is clear that good yield and high purity are important objectives in operating a crystallization process, but these two factors are not the only ones to be considered. The appearance and size range (大小范围) of a crystalline products(3) are also significant. It is especially necessary that the crystals be of(4) reasonable and uniform size. If they are to be further processed, reasonable size and uniformity (均匀) are desirable for washing, filtering, reacting with other chemicals, transporting, and storing the crystals. If the crystals are to be marketed as a final product, customers require individual crystals to be strong, non-aggregated (不凝聚), uniform in size, and non-caking(5) in the package. For these reasons, crystal size distribution (CSD) (6)must be under control (受到控制); it is a prime objective in the design and operation of crystallizers (结晶器).

In general, crystallization may be analyzed from the standpoint of (从…角度) purity, yield, energy requirements, and rates of formation and growth of crystals.

Notes

(1) crystalline form　结晶形状

(2) the fact 后面接两个由 that 引导的同位语从句。

(3) crystalline products　水晶制品

(4) be of = have, possess, 后面接名词，相当于系表结构。

(5) non-caking　无粘性的

(6) crystal size distribution　结晶粒度配给

Exercise

Directions: For the passage there are some questions or unfinished statements. Each of them is provided with four choices marked (a), (b), (c) and (d). You should decide on the best choice and then mark your answer.

1. Crystallization from liquid solution is important industrially because of_____.

a. the solute extracted being not always the most valuable product of the separation process

b. the variety of materials that are marketed in the crystalline form

c. the evaporation producing a slurry of crystals in a saturated mother liquor

d. the primary products from distillation of crude oil containing traces of materials

2. Crystallization affords a practical method of obtaining pure chemical substances in a satisfactory condition for_____.

a. package and storing

b. nonvolatile solute and volatile solvent

c. evaporation and crystallization

d. atmospheric and soil corrosion

3. It is especially necessary that the crystals be of _____ size.

a. condensed and discarded

b. spare and automatic

c. reasonable and uniform

d. initial and valuable

4. Crystal size distribution (CSD) must be under control; it is a prime objective in the _____ of crystallizers.

a. evaporation and crystallization

b. protection and application

c. construction and production

d. design and operation

5. Crystallization may be analyzed from the standpoint of purity, yield, and _____.

a. energy requirements

b. rates of formation

c. growth of crystals

d. all of the above

1.5 Extraction

Solvent extraction(1) is the transfer of a solute species (熔质类物质) from its initial location to a solvent known as the extracting solvent(2). The pure solute may be a liquid or a solid at the operating temperature (操作温度) but this is unimportant because initially the solute will be located either in a solution or in association with (与…混合) a solid. When the solute is in solution the extraction process is called liquid-liquid extraction, and the extracting solvent (萃取用熔

剂) must be substantially immiscible[3] with the original solvent. If, on the other hand, the solute forms part of a solid (which need no be "dry") the process is termed (称为) solid-liquid extraction.

In liquid-liquid extraction, the extracting solvent must have a suitably selective affinity[4] for the appropriate solute which sometimes occurs in company with (和…在一起) materials other than (除…以外) the original solvent. This selectivity is very important because the essence of liquid-liquid extraction is the separation of a particular solute from other materials[5] by means of selective transfer (选择性的传递) to the extracting solvent. It must be remembered that the solute extracted is not always the most valuable product of the separation process; the aim might be to purify (提纯) the original solvent by removal of an unwanted solute, or perhaps to remove one of two solutes from the original solution.

The technique of separation by solvent extraction is often attractive in circumstances where distillation is unsuitable. If, for example, the solute is heat sensitive, or present in very low concentration (浓度), then liquid-liquid extraction may be appropriate.

In solid-liquid extraction, one constituent (组分) of a solid is transferred to an extracting solvent and is thereby separated from the rest of the solid. The extracted material is not necessarily a solid but may be present in the bulk solid (块状固体) in a liquid form. Some solids even have an intrinsic[6] solvent content (熔剂含量) which becomes evident during the subdivision (细分) process. Sugar beet, for example, is extracted with water and is itself about 30% water by weight (按重量).

Since a solid does not flow as[7] do the fluids in liquid-liquid extraction, the equipment for solid-liquid extraction is different from that for liquid-liquid equipment.