Chemistry

Chemistry is a science that deals with the transformations of substances and their properties. We find it everywhere – in the substances that surround us, with which we work in laboratories, or in things and substances produced in industry. Chemistry has versatile uses – chemical products are used every day by doctors, farmers and construction workers. Chemistry is also used in the food industry and winemaking.

A laboratory technician in a hospital detects the presence of harmful substances in the body by chemical analysis (analysis) urine or blood Forensic science uses chemistry to solve crimes. Chemical methods are used to determine the purity of industrial products. Water coming out of taps in households is chemically cleaned and treated. Chemistry is also used in agriculture. One of the most extensive industries is the petrochemical industry, in which a large number of substances are obtained from oil (e.g.: fuels, plastics, paints, medicine,...)

Chemistry proves

After drinking an alcoholic beverage,alcohol (ethanol) enters the blood of a person and then from the lungs into the exhaled air. A tube attached to a plastic bag contains chemicals that turn yellow when in contact with ethanol, and a green substance is produced. This simple device allows the police to easily find out whether the controlled driver has consumed an alcoholic beverage and thus does not endanger the safety of road traffic.

Substitute Foods

Chemistry has a wide application in the food industry in the production of new dishes and in cleaning food from harmful substances. For example: butter is a solid animal fat, whereas vegetable fats are mostly liquid oils. Therefore, vegetable oils are solidified by catalytic hydrogenation, in which, in the presence of a nickel (Ni) catalyst, liquid fat reacts with hydrogen to form a solid fat.

With this procedure, we can obtain a substance similar to butter from vegetable oil. As the first solid substitute for butter, margarine was produced (albeit in a different way) in France in 1868.

Chemistry in the past

Humans have been using chemical changes since the discovery of fire. They prepared their food on the fire and fired clay vessels in it. They also discovered the production of metals using fire. During the development of human society, substances with special uses were discovered, e.g.: yeast for the production of beer and wine, food preservation was carried out by salting and smoking, plant extracts were used to dye fabrics, bark extract was used for leather tanning, cosmetic treatments performed with natural colors.

Glass, at first used only as an ornament, was first shaped by blowing around 100 BC. Using special substances, the Egyptians mummified their dead. Many chemical discoveries were made in China - for example: lacquer was already produced in China around 1300 BC. Other important Chinese discoveries include the production of paper and gunpowder.

First chemists

In ancient Greece, philosophers formulated theories about the origin and origin of matter. The theories mixed religious ideas about substances with acquired experience and gave rise to alchemy. Alchemists therefore connected the results of experiments with the action of mystical deities. Belief in the mutual transformation of substances led them to try to transform substances into precious metals - the so-called *transmutation*. The main goal of the alchemists was to transmute lead into gold. Distillation was a commonly used method of preparing scented essences and essential oils. Furthermore, alchemists discovered a way to prepare inorganic acids that were several times stronger than ordinary organic acids (usually obtained from fruit juices or wine vinegar). In addition, medicine based on the administration of substances as drugs also developed. Another field where chemistry developed was mining and metallurgy. Methods of extracting metals from ores were discovered, methods of proving individual metals were improved, and new alloys were prepared.

Study of Chemistry

In the Middle Ages, the idea that the human body is a system that can be treated with chemical substances (the period of iatrochemistry) became widespread. Andreas Libavius (1560–1616) published one of the first chemistry textbooks, „Alchymia” in 1597. His book contains knowledge from pharmacy and metallurgy (metal processing).

Chemical Aids

Long metal tongs were used to remove the crucibles from the hearth. The crucibles were made from bone ash and were used to melt metals. The molten metal was poured from the crucible into the prepared mold. Some other tools are still used today – for example: a mixing bowl with a pestle, flasks, funnels, beakers and filters.

Electricity and chemistry

Electrical energy is obtained from chemical substances and chemical substances are produced with its use. In 1800, Alessandro Volta produced the first galvanic (electrochemical) cell. Redox reactions taking place in galvanic cells are the source of electric voltage and current. After Volta's discovery, chemists began to investigate the effects of electric current on aqueous solutions of various compounds. An electric current was found to split water into oxygen and hydrogen. However, pure water conducts electricity poorly. If we add a small amount of soluble salt to it, the conductivity will improve. This fact was discovered by Michael Faraday (1791–1867) and he proved that the electric current is conducted by the ions contained in the solution. Aqueous solutions of acids, bases and salts conduct electricity very well because they contain freely moving ions of these substances.

Chemistry and life

Chemistry dealing with living organisms is called **biochemistry**. Living organisms and their building blocks - cells consist of 70% water, carbon compounds and a small amount of metal compounds and other elements. Plants and animals need carbon for their growth, after they die, the carbon returns to the soil or is released in the form of carbon dioxide (CO_2). deoxyribonucleic acid (DNA) affects the life of individual cells. It controls the production of proteins, which are the basis of living organisms. Proteins make up our organs - muscles, hair, skin, they are also part of enzymes and hormones catalyzing reactions in our body and maintaining the balance metabolism. During metabolism, substances taken in food are transformed into simpler substances, from which the organism obtains the energy necessary for its existence and the substances needed for its construction.

Using chemical Analysis

Chemical analysis (analysis) in industry is used to control raw materials and final products. It can be used to monitor the quality of food as well as to perform tests in the evaluation of manufactured drugs. A significant technique used in analysis is weighting. The first scales, which for their time provided accurate enough weight measurements, were produced in 1800. Some analytical methods use volume measurements - the first gas researches used the *eudiometer*. Special chemical tools – pipettes and burettes – are still used to measure liquid volumes. From the 19th century, the importance of food analysis grew.

Chemical industry

Until the middle of the 18th century, processes known from ancient times were used in chemical production (e.g. production of glass, ceramics, soap and dyes). Gradually, however, production focused on synthetic materials. Today, most of the chemical industry depends on **sulfuric acid (H_2SO_4)** – it is used in the production of dyes, metals, industrial fertilizers and plastics. The glass and soap industries depend on substances such as **sodium carbonate (Na_2CO_3)** and **potassium carbonate (K_2CO_3)**.

Nicolas Leblanc (1742-1806) discovered the process of preparing sodium carbonate from sodium chloride (table salt). It was replaced by the cheaper *Solvay* procedure, developed in 1865 in Belgium. The expensive construction of single-use industrial facilities led to the use of continuous (continuous) production, in which products are constantly withdrawn (or: unreacted substances are introduced back into production).

Chemistry and Agriculture

In 1839, the German chemist Justus von Liebig (1803–1873) built a teaching laboratory. During his lifetime, he proved the importance of elements such as phosphorus and potassium for plant growth. His research enabled the emergence of modern industry and industrial fertilizers and thus revolutionized agriculture.

References

Literature

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