# THE ROLE OF CHEMISTS IN THE DEVELOPMENT OF ORGANIC SYNTHESIS

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**Annotation:**Berthlot's important scientific works can be divided into three groups. In the first, the scientist reveals the scientific foundations of the synthesis of natural organic compounds - fats and oils - from urea. In the second series of works, Berthlot classifies the elements necessary for the synthesis of simple organic substances, and in the third group of works, he describes his practical experiments and theoretical considerations on the pyrogenic synthesis of hydrocarbons. Along the way, he studied the oxidation and reduction processes of all the compounds he worked with, and also investigated the properties of various organic compounds.

**Keywords:** Organic synthesis, alkyl, volatile potassium, nitric acid, benzoic acid,

The French chemist Théophile Jules Peluze (1807-1867), a student of Gay-Lussac, succeeded in preparing cyanide alkyls by reacting alkylsulfonic acid salts with potassium cyanide in 1834. In the same year, Jean-Baptiste Dumas (1800-1884) discovered that formic acid was formed from chloroform by reacting caustic potassium. Thus, Dumas found a way to obtain acids from halogen derivatives by hydrolysis.

In 1842, a chemist named Melzens proposed a method for the recovery of halogen derivatives by amalgamation of alkali metals. Five years later, in 1848, a group of scientists - Jean Baptiste Dumas, Malaguti, Leblanc, Frankland and Kolbier - proposed a method for obtaining acids from low-carbon compounds using nitriles. At the same time, the German chemist Erhard Micherlich (1794-1863) was the first in history to synthesize nitrobenzene and benzene using a mixture of saturated nitric acid and sulfuric acid. As early as 1832, the German chemists Justus Liebig and Friedrich Wöhler had observed the conversion of benzaldehyde to benzoic acid in the presence of alkali; by 1853, the Italian chemist Stanislao Cannissaro (1826-1910) had proven that the corresponding alcohol was released in this process. It is also worth mentioning the discovery of the phenomenon of oxidation of carbohydrates and alcohols to acids in the presence of platinum salts (black powder).

These and similar examples indicated that there were great prospects for the production of organic compounds. Scientists increasingly began to firmly believe that the time was approaching when the practice of artificial synthesis of organic substances would be successfully implemented.

By 1854, after the synthesis of urea by Kolby, the natural boundary between organic and inorganic compounds, which had previously been used by chemists in classifying substances, disappeared. Previously, chemists considered it impossible to artificially synthesize organic compounds from inorganic compounds. The success of the synthesis of urea removed such a boundary.

The French chemist Marcellin Berthelot (1827-1907) made a particularly significant contribution to the development of organic synthesis at a new stage. In fairness, it should be said that before the scientific work of Berthelot, the department of organic synthesis did not exist as an independent department in chemistry. Berthelot was the first to begin to organize the field of organic synthesis into a single system.

Indeed, before Berthelot's work "Organic Chemistry Based on Synthesis", published in 1860, no systematic research was carried out in this area. Before that, only two important scientific works had been carried out on the complete synthesis of organic substances from elements. The first of them was the preparation of urea by Friedrich Wöhler, and the second was the synthesis of acetic acid by Kolby. Although these syntheses revealed very interesting aspects for the science of chemistry, they should be considered as a kind of special case, and indeed, after both processes, chemists themselves did not realize how great a scientific direction they were on, that is, they had found a way to open a completely new field of science - organic synthesis. These studies did not propose any specific general method for organic synthesis.He managed to synthesize oil in 1853!

When Berthelot presented the article on the artificial synthesis of oil and the scientific basis of the experiment to the Paris Academy of Sciences, it was perceived as an unprecedented innovation and a great sensation in the whole world of science. He was immediately awarded the degree of Doctor of Physical Sciences. As the next task, Berthelot set himself the task of synthesizing ethyl alcohol from ethylene and water.

After the reaction was completed, the scientist rinsed the mixture with water and then carried out the distillation. As a result, the condensate obtained by distillation turned out to be pure ethyl alcohol. By this, Berthelot had conclusively proven that organic substances can indeed be synthesized from inorganic substances. The scientist did not hide his happiness with this result, and later recalled in his memoirs that he told his loved ones with great pleasure. He said that "organic substances are essentially no different from inorganic substances, they can be obtained by the same methods. Scientists must believe that there is no "life force". The chemist can control the reaction at will, he said then.

In this way, Berthelot carried out many synthesis experiments. At that time, the scientist's colleagues joked that "if the problem is posed correctly, Berthelot can synthesize anything." The scientist achieved unprecedented success by conducting excellent and scientifically sound experiments on hydrocarbons, carbohydrates and alcohols obtained by distillation. He introduced the method of restoring organic compounds with hydrogen iodide into science and brought many other innovations to chemistry. In 1867, he was awarded the second Jacquere Prize for his unparalleled achievements in science. The first Jacquere was awarded to him in 1860.

In 1860-1864, Berthelot summarized the methods and instructions for numerous organic synthesis experiments he conducted and published two books entitled "Organic Chemistry Based on Synthesis" and "Lectures on General Methods of Synthesis in Organic Chemistry".

Currently, synthesis is the most basic foundation of the chemical industry. For example, the production of mineral fertilizers, which are the key to food security, is based on the synthesis of ammonia, and so on. Synthetic fibers, synthetic fuels, lubricants and bleaching materials, and so on are not inferior. In this sense, Marcelin Berthelot and his discoveries in organic synthesis are rightfully recognized as one of the greatest events in the history of mankind.

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