

C1 Inclusion: We burn sugar

The historical development of the term “catalyst”

People have known for thousands of years that beer and wine are produced through fermentation processes. They could also produce acetic acid. Without understanding the principle and the progression of these reactions, people realized that catalysis was a phenomenon that occurred all the time. Catalysis first stirred up scientific interest about two hundred years ago. The first people to carry out studies in this field were Antoine Parmentier (1781), who discovered the catalytic decomposition of starch into sugar (through experiments), and Joseph Priestley (1783), who succeeded in synthesizing ethylene from ethanol in the presence of clay (aluminum oxide). Other inventions based on the principle of catalysis were the night lamp of Humphry Davy (1816) and the lighter of Johann Wolfgang Döbereiner (1832). The night lamp burns ethanol on a platinum, copper, or constantan wire. Döbereiner's lighter produced hydrogen initially from an acid and zinc, and the hydrogen then spontaneously ignited on a platinum sponge.

Swedish researcher Jöns Jakob Berzelius (1779-1848) was the first to study these reactions and found out that the reaction mixture always contained a substance that was present in its original form both before and after the reaction. He called this type of reaction “catalysis.” He believed that these substances were solely responsible for adding energy (“catalytic force”) and did not participate in the reaction.

- “The catalytic force seems essentially to consist of the property that bodies, by their mere presence and not by their own affinity, are able to awaken affinities that are dormant at this temperature (...)” (1836)

Alwin Mittasch (1939) was the first person to describe the catalytic force named after Berzelius more comprehensively. In his opinion, a catalyst is a

- “substance that, although it seemingly does not participate in the reaction, induces or accelerates this reaction or guides it in certain pathways.”

In 1875, Marcellin Berthelot (1827-1917) first hypothesized the presence of intermediate bonds during catalytic reactions. In 1894 and 1901, German chemist Wilhelm Ostwald (1853-1932) introduced the catalyst definition that is nearly unchanged to this day:

- “Catalysis is the acceleration of a chemical reaction, which proceeds slowly, by the presence of a foreign substance” (1894).
- “A catalyst is any substance that changes the speed of a chemical reaction without appearing in the end product of the reaction” (1901).

In 1909, Ostwald received the Nobel Prize for Chemistry for his work in the field of catalysis.

Definition: Catalyst

A catalyst is a substance that increases the speed of a chemical reaction without being consumed in the reaction and without altering the final condition of thermodynamic equilibrium of this reaction.

Tasks:

1. Indicate the reaction equations for the catalytic reactions mentioned in the text.
-
-

2. Conduct the experiments on the decomposition of starch into sugar. (Experimento | 10+: C1
We burn sugar)
3. Complete the following table.

Name	Year	Proposed definitions
Berzelius		
	1939	
		Catalysis is the acceleration of a chemical reaction, which proceeds slowly, by the presence of a foreign substance
Ostwald		

4. Name at least two necessary properties of a substance for it to be suitable as a catalyst.
-