- diffusion of products from the surface of the catalyst into the stream.

In chemical technological processes, not individual catalytically active substances are used, but contact masses representing complex systems, the composition and nature of the components of which should ensure the most effective and stable course of the catalytic process.

The contact mass consists of a catalytically active substance (catalyst), activator and carrier.

The nature of heterogeneous catalysts is very diverse and depends on the type of catalyzed reactions. As catalysts, mainly metals in the free state (platinum, silver, copper, iron) and metal oxides (zinc, chromium, aluminum, molybdenum, vanadium) are used. In cases where two reactions catalyzed by different substances occur simultaneously in the system, bifunctional catalysts consisting of two corresponding components (for example, zinc oxide and aluminum oxide in the process of dehydration and dehydration of ethanol to butadiene) are used.

An activator (promoter) **is a substance introduced into the contact mass to increase the activity of the catalyst and increase its duration. Activators have a selective effect, so their nature depends on the nature of the catalyst.**

A carrier (treger) **is a material on which a catalyst is applied in order to increase its surface, give the mass a porous structure, increase its mechanical strength and reduce the cost of the contact mass. Pumice, asbestos, silica gel, diatomaceous earth, and porous ceramics are used as carriers in contact masses.**

Contact masses are made by methods:

- precipitation of hydroxides and carbonates from salt solutions with subsequent formation and calcination;

- joint pressing of a mixture of components with a binder;

- fusion of components;

- impregnation of the porous carrier with solutions of the catalyst and activator.

Contact masses are formed in the form of granules, tablets or elements of various configurations. Metal catalysts are made and used in the form of fine nets and blocks.

The effectiveness of the use of catalysts in industrial heterogeneous catalytic processes substantially depends on their technological characteristics.

These include:

- activity;
- ignition temperature;
- selectivity of action;
- resistance to poisons;
- porosity;
- mechanical strength;
- thermal conductivity;
- availability;
- cheapness.

When the action of the catalysts is different, the common thing for them is an increase in the rate of the catalyzed reaction. The same reaction can occur in the presence of catalysts of different nature and without them. The difference lies in the speed of the process. For example, the rate of hydrogenation of ethylene on a chromium catalyst is 1.0; on a nickel catalyst – 13.0; platinum - 100.0; palladium – 1,000.00; on rhodium – 1,800.00. It follows that rhodium has the greatest activity. Namely, the rate of this reaction, depending on the nature of the catalysts, determines their activity.

The most important property of the catalyst is its ability to maintain activity over time, called *stability*.

In homogeneous catalysis, the catalyst can be deactivated due to the accumulation of products in the reaction zone that reduce the concentration of active centers.

In heterogeneous catalysis, the decrease in stability is due to both physical and chemical changes.