



where  $A$  and  $B$  are the initial reactants,  $R$  is the target product;  $D$  is a byproduct.

Then:

$$S = \frac{m_R}{m_R + m_D} ;$$

where  $m_R$  and  $m_D$  are the mass of the target and by-product, respectively.

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Thus, it is possible to define the catalysis process as a selective acceleration of one of the thermodynamically possible reaction directions. It follows from this that at a given temperature  $T$ , it is possible to change the difference  $E_{non-cat} - E_{cat}$  by selecting a catalyst and, consequently, to direct the process towards the formation of the target product.

Selectivity of the catalyst is of great importance in such chemical processes as the oxidation of ammonia in the production of nitric acid, various processes of organic synthesis. Using catalysts, it becomes possible to obtain various target products from the common raw material.

The porosity of the catalyst characterizes its specific surface and, therefore, affects the contact surface of the catalyst with the reagents. For catalytic processes, the availability of the solid catalyst surface for reactants is of great importance, since the larger the contact surface, the higher the rate of conversion to the target products per unit time on the same catalyst.

The porosity of the catalyst is expressed as the ratio of free volume of pores to the total volume of the catalyst and is characterized by its specific surface, i.e., surface per unit mass or volume of catalyst. Modern catalysts have a very developed specific surface area, reaching 10-100 m<sup>2</sup>/g.

The mechanical strength of the contact mass should be such that it does not collapse under the action of its own weight in apparatuses with a fixed catalyst bed and does not wear out in apparatuses with a moving catalyst bed and in FB ("Fluidized bed") apparatus.

### **Contact Poison Resistance**

The practical use of heterogeneous catalytic processes is hindered by the phenomenon of a decrease in catalyst activity during the process.

The reasons for this are:

1. a decrease in the active surface of the catalyst during the deposition of dust or reaction products on it;
2. mechanical destruction of the catalyst;
3. poisoning of the catalyst with catalytic (contact) poisons.

**Catalyst poisoning is a partial or complete loss of its activity under the influence of an insignificant amount of some substances - contact poisons. Contact poisons form surface chemical compounds with activated catalyst centers and block them, reducing the activity of the catalyst. For each group of catalysts, there are certain types of contact poisons.**

Catalyst poisoning can be reversible when contact poisons decrease the activity of the catalyst temporarily while they are in the catalysis zone, and irreversible when catalyst activity is not restored after contact poisons are removed from the catalysis zone. Contact poisons can be contained in the reagents entering the catalytic process, and also form as by-products in the process itself.

Resistance to contact poisons is an essential property of industrial catalysts. In order to lengthen the life of contact masses in chemical technological processes, a stage of thorough purification of reagents from harmful impurities and a catalyst regeneration operation (for example, burning high-carbon polymer film enveloping catalyst grains in catalytic cracking processes, oil products, isomerization, and dehydrogenation of organic compounds) are provided.