

temperature (about 200 °C), good plasticity. The disadvantage of platinum is its rapid destruction at high temperatures under the influence of high-speed flows of reagents and catalyst poisons. This leads to the loss of an expensive catalyst and a decrease in the yield of *NO*, which was the reason for the search for catalytically active alloys of platinum with other metals.

The conducted industrial tests showed stable operation of catalysts made of platinum with palladium additives, as well as from the triple alloy *Pt-Rh-Pd*; this was the basis for their industrial implementation. As catalysts, platinoid catalysts (*Pt*, *Pt-Rh* and *Pt-Pd-Rh*-alloys with a platinum content of 81– 92%) are used.

The catalysts used for contact oxidation of *NH₃* are made in the form of nets. This form of catalyst is convenient in operation, associated with minimal metal costs, allows you to use the most convenient type of contact apparatus in operation. In Russia, wire meshes with a diameter of 0.09 mm (SS 3193 - 74) are used, the cell side size is 0.22 mm, the number of cells per 1 cm of length is 32, per 1 cm² – 1,024. Platinum-rhodium (GIAP-1) and platinum rhodium-palladium (alloy No.5) catalysts are very sensitive to a number of impurities that are contained in ammonia and air.

Such impurities include:

- phosphorus and arsenic hydrides,
- fluorine and its compounds,
- dichloroethane,
- mineral oils,
- acetylene,
- sulfur dioxide,
- hydrogen sulfide, etc.

The most powerful catalyst poisons are sulfur and fluorine compounds. Impurities significantly reduce the selectivity of the catalyst, contribute to an increase in the loss of platinum.

To maintain a stable degree of ammonia conversion, thorough purification of the ammonia-air mixture and from mechanical impurities, especially from iron oxides and dust of an iron ammonia synthesis catalyst, is necessary. Dust and iron oxides, getting on the catalyst grids, clog them, reducing the contact surface of gases with the surface of the catalyst, and reduce the degree of oxidation of ammonia.

In the process of ammonia oxidation reaction, the surface of platinoid meshes is strongly loosened, elastic filaments of the meshes become brittle. In this case, the surface of the grid increases by about 30 times. First, this leads to an increase in the catalytic activity of the catalyst, and then to the destruction of the grids. In practice, it has been established that catalyst meshes for work under pressure of 0.73 MPa withstand service life from 8 to 9 months.

The effect of the catalyst

One of the problems of increasing the yield of nitric acid is the creation of such a catalyst that would act selectively on the reaction of contact oxidation of ammonia to nitric oxide (II), with little effect on side reactions. The main reaction proceeds very quickly in the external diffusion region, and the process is limited by the diffusion of oxygen to the catalyst surface. This causes an increased concentration of ammonia on the catalyst surface compared to oxygen and an increase in the specific gravity of the side reactions of incomplete oxidation with the formation of nitrogen and nitrous oxide. Therefore, a significant excess of oxygen at the surface is needed to displace ammonia from it. Then its oxidation will be deeper to *NO*.

Effect of O₂:NH₃ flow ratio on NO yield

When the ratio of *O₂:NH₃* is more than 1.8, the selectivity for *NO* reaches a constant maximum value close to 100% and then practically does not change, which corresponds to the ammonia content in the ammonia-air mixture of 9.5–10.5 (vol. %). With an *O₂:NH₃* ratio of more than 1.8, the *NO* selectivity reaches a constant maximum value close to 100% and then remains virtually unchanged, which corresponds to an ammonia content in the ammonia-air mixture of 9.5-10.5 (vol.%). It should be borne in mind that at ordinary temperature the mixture of ammonia with