Ideal catalyst has to combine a number of essential properties which are summarized as: high catalyst activity for desired reactions, maximum selectivity for the preferred reactions, good physical strength, good gas flow properties as pressure drop and heat transfer and stability of including resistance to poisons and ability to withstand plant upset to ensure a long life.

During the time of exploitation these essential properties were changed as strength, activity, porous structure and volume. So, after use and regeneration of reformer catalyst R – 16G, for speed up conversion of reforming benzene, the percentage of conversion of benzene fraction is considerably smaller than that of new catalyst sample. For examination of the cause the real and model sample of catalyst R – 16G were used. The model samples were prepared from the new catalyst by the heating at 400 - 1000°C in porcelain crucible in muffle furnace for one hour. Before measurement the samples were ground and homogenized in Spex type mixer mill and manually in agate mortar. The prepared samples were measured in a Philips diffractometer system (counting technique), Semiautomatic x – ray spectrometer, type Philips and Scanning Electron microscope, type Joel.

The obtained i.e. the characteristic x–ray diffraction patterns show change in phase composition, figure 1 and diffraction profile line, at 1000°C reduced broadening and splitting of line and exhibited new diffraction line, figure 2.

According to Rooksby¹ this change has been the result of enlargement to the crystallite size. The similar observation was made during the measuring of relative intensities² of analytical line $PtL_\beta$ and $ReL_\alpha$, figure 3. Heating led not only to the growth of the γ–alumina crystals and strurctural tranformation but also reactions and changes in morphology³, ⁴. Morphological changes on the sphere surface and on vertical secion of new sample were equal. To other samples, surface morphology exhibited drastic change, figure 4. The catalyst surface was no longer smooth and tended to assume a rough texture which, in turn, directly on Pt and Re distribution on sphere surface thus causing deactivation of the catalyst⁵, ⁶.
Figure 1 Part of X-ray diffraction patterns of new catalyst sample, A and with reduction activity, B

Figure 2 Change in the X-Ray diffraction powder pattern of model samples caused by annealing various temperature

Figure 3 Standard deviation of relative intensities of $PtL_{\beta}$ and $ReL_{\alpha_1}$ with respect to temperature of annealing.
Figure 4. Scanning electron micrographs of A – surface and B – vertical section of spheres of new catalyst sample 1 and annealing at 1000°C – 2. Enlargement 500 X.