

VI. Summary

In this work are summarized the observations and experiences obtained by experiments with iron catalysts since 1936. The purpose of the experiments was to cultivate the catalysts further, especially with respect to increased alcohol yields, in particular, ethyl alcohol, yields. It appeared that the direction of the catalyst depended on its composition in the following manner:

1. The more "basic" the catalyst, i.e. the more the basic additives, especially potassium, preponderates among its added promoters, the more the catalyst tends toward the formation of hydrocarbons.

2. The more "acidic" the catalyst, i.e. the more the "acidic" components (e.g. TiO_2) preponderate among the additives, the more the catalyst tends toward the formation of oxygen-containing compounds, in particular, alcohols. Rising molar weight of these additives resulted in improvement of the yields, especially in the case of ZrO_2 .

3. There appears to exist a certain regularity in the ratio of ferrous oxide (magnetite) to the individual additives. An attempt was made to calculate a corresponding regularity with the

best catalysts and to arrive at an ideal formula by comparing the mixtures, the analyses of the catalysts, and their yields.

4. It was found that, in contrast with the original assumption, that it was not the catalysts with the optically most marked lattice anomalies which are best, but that the best catalysts exhibit the least disturbances and, correspondingly, have absorbed all the additives regularly into their lattice. These facts which were established in the case of the unreduced catalyst also determine the efficiency of the catalyst which is to be reduced to metal.

5. The added substances, which are regularly incorporated into the lattice are thus uniformly and regularly dispersed throughout the entire catalyst and produce active spots in the finished reduced catalyst. Not only the type of these incorporated spots but also the reciprocal action is of decisive importance, i.e. the equilibrium of these individual points with respect to themselves within the ground lattice and with respect to the lattice itself.

As long as X-ray examinations do not furnish us with any real facts about the kind of dispersion, we can only put forward assumptions and we cannot state any definite laws.

Since it appears that the original problem as it was stated has been to a certain degree exhausted, this summary of the current state of affairs should be the point of departure for a further treatment of this catalyst field.