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Zh. B. Makhatov[1], B. Sh. Kedelbayev[1], Peter Lieberzeit[2], G. A. Rysbayeva[1], Zh. N. Kaipova[1]

[1]M. Auezov SKSU, Shymkent, Kazakhstan,
[2]University of Vienna, Vienna, Austria.
E-mail: mjasik92@mail.ru, makhatov8008@mail.ru

STUDY OF THE COMBINED HYDROLYSIS-HYDROGENATION OF WHEAT STRAW CELLULOSE IN ORDER TO OBTAIN SORBITOL

Abstract. The article presents the results of studying the implementation of a combined (hybrid) hydrolysis-hydrogenation process for the production of sorbitol. However, the selectivity for sorbitol has a maximum at a pressure of 6.0 MPa. That is, the proportion of the desired product-sorbitol with increasing hydrogen pressure above 6,0 MPa is reduced due to the formation of five-atom alcohols. This expressed in the growth of the total yield of the polyols. Thus, we chose 6.0 MPa as the optimum pressure. In the process of chemical hydrolytic hydrogenation of wheat straw cellulose into sorbitol, the influence of the temperature of the experiment studied in the range of 140-220 °C. The optimal time for the process of catalytic conversion of wheat straw cellulose under the conditions chosen by us is 60 minutes. Until the sixtieth minute, the cellulose conversion reaction is insignificant, and after 60 minutes its values are within the error margin. The same pattern observed with the selectivity index for sorbitol.

Analysis of the resulting polyols carried out by paper chromatography. The nickel catalyst prepared by impregnation, in addition, a ferroalloy (FS) was added in an amount of 5% by weight of nickel.

Thus, we have shown the possibility of obtaining sorbitol from wheat straw cellulose by hydrolytic hydrogenation in the presence of a supported nickel catalyst. The optimum process conditions were determined: the temperature of the experiment was 180°C, the hydrogen pressure was 6.0 MPa, and the reaction time was – 60 minutes.

Key words: wheat straw, sorbitol, cellulose, catalyst, chemical hydrolysis, biomass.

Introduction. The world's reserves of fossil organic raw materials are huge they represented by oil, natural gas and coal, but soon or late they will be exhausted. As an alternative to fossil fuels, renewable sources of energy and organic raw materials used. The most important of these is plant raw materials, which formed in the process of photosynthesis.

Biomass is a renewable resource and plays a role in preventing global warming by slowing down carbon dioxide emissions. In the production of chemical products from biomass, methods for converting biomass to sorbitol, ethanol, lactic acid and other useful chemical products by enzymatic or chemical methods [1-6].

At present, the main material used for biological processing is starch, obtained from corn. From the point of view of the resources of the main structural constituents of plant components can used, cellulose is present in much larger quantities than starch. However, methods for converting cellulose into chemically useful products by reducing its molecular weight (depolymerization) not developed, and this resource is currently not actually used. A large number of studies carried out in the field of cellulose decomposition by means of enzymes. However, there remain important problems associated with enzymatic methods, due to low reaction rates and the need significantly increase the activity of the enzyme and separate it from the product. The advantages of cellulose in its renewability or even the practical inexhaustibility of plant raw materials [7-12]. Of particular interest is the search for technologies of a one-stage, combined (hybrid) method of obtaining valuable substances from the cellulose that excludes the stages of isolation and purification of products. A one-step organisation makes it possible to obtain from a plant polysaccharide, by hydrolysis-hydrogenation, a compound such as sorbitol, which is one of the