DEHYDRATION POSSIBILITIES OF BIOETHANOL BY USING PHOSPHATES

Gunārs Brēmers[*], **Gints Birzietis**[*], **Vilnis Gulbis**[*], **Arnolds Šķēle**[**], **Anita Blija**[***]
Latvia University of Agriculture
[*]Faculty of Engineering, [**]Forest Faculty, [***]Faculty of Food Technology

Several methods are used to separate ethyl alcohol from water in the production of bioethanol. A part of them are connected with use of different salines, which enables to save energy consumable in the process.

The oldest and the most investigated is the spirit-saline distillation method [1, 2]. By adding appropriate salines, for example, calcium chloride, potassium acetate, to the distillatable spirit-containing solution, the content of spirit in vapour produced by the boiling solution is higher than if no salines are added, thus exceeding the limiting margin, so called azeotropic point of the common distillation, which conforms to spirit concentration 97.2% of volume.

We have been involved in spirit-saline distillation research for more than ten years. As a result, a spirit-saline distillation modification – a non-reflux spirit-saline distillation have been worked out [3]. There an additional effect is used, – water bounds to salines during the crystalline hydrates formation process. Calculations show the non-reflux spirit-saline distillation allows reduction of energy consumption for almost 50% in comparison with the molecular filter method used in practice.

According to recent information [4], even more energy saving could be achieved by using crystalline hydrate of magnesium phosphate for dehydration of ethyl alcohol. Crystalline hydrates of this saline are able to bound spirit molecules, which after that are separated by vacuum distillation at medium temperature (up to 45°C), thus obtaining absolute alcohol.

Taking into consideration the priorities of energy saving, we have undertaken to check this information.

Unfortunately, the saline of phosphoric acid mentioned in the publication is not available on chemical market, and shall be synthesized for experiments. We have done this in cooperation with RTU Institute of Inorganic Chemistry (A. Dindune, Z. Kaņepe, R. Kreile). The obtained saline has been checked by the X-ray-phases differential-thermic and infrared ray spectroscopy methods. The instrumental checks proved the identity of the synthesized saline to the given chemical formula.

In order to proceed with research of the further use of saline, determining its spirit absorption abilities and segregation of absolute alcohol, a greater amount of saline shall be accumulated which is being done at the moment.

Conclusions

1. The absolute alcohol obtaining method by using crystalline hydrates of phosphates offers a considerable energy economy (up to 80%), which is a prior issue, so the suggested method shall be checked.
2. When performing the instrumental check, the crystalline hydrate of phosphoric acid synthesized by us fully conformed to the given chemical formula.
3. In order to perform the check of spirit absorption abilities of the synthesized saline and to start segregation of absolute alcohol, a greater amount of saline shall be accumulated.

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