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Catalytic decomposition of high-boiling residue fractions formed during the styrene and propylene oxide producing process

© **Tulkinbek S. Sitmuratov,**[+] **Lyubov A. Petukhova,**
Ilmira I. Bakhtinova, and **Alexandr A. Petukhov***
Kazan National Research Technological University. K. Marx St., 68. Kazan, 420015.
Tatarstan Republic. Russia. E-mail: sitmuratov@bk.ru

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*Supervising author; [+]Corresponding author

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Abstract

One of the features of vapor-phase methylphenylcarbinol dehydration in the process of the joint production of styrene and propylene oxide by the hydroperoxide method is the formation of a significant amount of high-boiling products at almost all the main stages of styrene-monomer production. fractions of high-boiling products. Both at the methylphenylcarbinol separation stage, steam condensate purification, and at almost all reaction mass separation of styrene production stages are formed. The amount of high-boiling products, containing fractions varies widely. At the same time, along with high-boiling substances, these fractions contain significant amounts of such valuable components as ethylbenzene, styrene, acetophenone, methylphenylcarbiinol, which are irretrievably lost, worsening the expenditure rate for the raw materials of this process by fire method disposal. In addition, utilization operation by fire method itself requires significant energy expenditure. Thus, in general all these, in the joint production of styrene and propylene oxide process hydroperoxide method, leads to deterioration of technical and economic indicators.

Methylphenylcarbinol dehydration process is carried out in the presence of γ-Al_2O_3 in a two stage adiabatic reactor with vapor phase at a temperature range 290-320 °C and water vapor, taken in a weight ratio of 1:1-2 to the raw material, at a volumetric feed rate of the initial fraction of 0.6 h^{-1}.

The paper presents the results of high-boiling products catalytic decomposition in the vapor-phase and liquid-phase dehydration regimes using heterogeneous and homogeneous catalysts samples with the formation of an additional amount of styrene and such components contained in the initial fraction, as ethylbenzene, methylphenylcarbinol and acetophenone. Samples, prepared based on aluminosilicates and synthetic zeolites mixture, prepared with variable valence metal oxides additives were used as heterogeneous catalysts. For homogeneous catalysis, catalysts samples were mixtures of acids in the presence of oxygen- and nitrogen-containing compounds.

The principal possibility of production wastes utilization which are currently exposed to neutralization by fire method is shown. Best results were achieved in the presence of heterogeneous catalysts by carrying out the vapor phase process.

References

[1] P.A. Kirpichnikov, V.V. Beresnev, L.M. Popova. Album of main synthetic rubber industry productions technological schemes. 2nd edition, revised. *Leningrad. "Chemistry".* **1986**. 224p. (russian)
[2] *Ru 2104991* A.A. Petukhov, V.A. Komarov, V.A. Belokurov, I.M. Vasiliev, A.P. Vorozheikin, V.P. Zuev. et al. Method of producing styrene. PJSC «Nizhnekamskneftekhim». (russian)
[3] *Ru 2083543* V.A. Komarov, A.A. Petukhov, G.Z. Sakhapov, V.A. Belokurov, I.M. Vasilyev, V.P. Zuev, G.N. Melnikov. Method of producing styrene. PJSC «Nizhnekamskneftekhim». (russian)