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O-ALKYLATION CATALYSTS

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Plan

- Introduction;
- O-Alkylation;
- Acid and heterogeneous catalysts;
- Conclusion

O-alkylation

Alkylation by O, S, and N atoms is the main method for the synthesis of ether-bonded compounds, mercaptans and amines.

Among the processes of O-alkylation, two have gained practical importance:

- alkylation of alcohols and phenols by chlorine derivatives;
- alkylation of alcohols with olefins.

As alkylating agents are used:

- halogen derivatives;
- unsaturated compounds;
- alcohols and ethers of sulfuric and sulfonic acids.

Catalysts of O-alkylation

- For alkylation of phenols mainly use: protonic acids (H_2SO_4, H_3PO_4) or catalytic oxides of type Al_2O_3 and aluminosilicates.

$AlCl_3$ is not used, since with it phenols form inactive salts of $ArOAlCl_2$, which do not catalyze the process.

The activity of the catalyst decreases in a row:

$$H_2SO_4 > H_3PO_4 > \ p-toluenesulfonic\ acid$$

Acid catalysts

- When using acid catalysts, the process is carried out under mild conditions, which allows to obtain a large yield of p-alkyl derivatives and reduces the number of polymerization products.

Disadvantage of sulfuric acid (H_2SO_4) is that at 50-120 degrees temperatures the formation of sulfonated phenols is possible.

A common disadvantage of using acid catalysts in liquid form is the need to wash the products from the catalyst and the significant formation of waste water.

Heterogeneous catalysts

Active alkylation catalysts are heterogeneous catalysts aluminum oxide, modified boron trifluoride, zeolites containing rare earth elements.

Heterogeneous catalysts are devoid of the above disadvantages, but their activity is significantly lower, which implies the process at higher temperatures:

- In the liquid-phase process using ion-exchange resins KU-2 as a catalyst proceeds at temperatures of 120°C;
- in the vapor-gas phase in the presence of aluminosilicates-at 200-400°C.

Conclusion

Thanks for your attention!