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Obtaining Butyl Acetate by the Method of Hydrolysis

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ABSTRACT: Butyl acetate (butyl ether of acetic acid) is the most common solvent in the production and use of paints and varnishes. Dissolves cellulose ethers, oils, fats, chlorinated rubbers, vinyl polymers, carbiol resins, etc. The addition of butyl acetate together with a small amount of butyl alcohol prevents whitening of the lacquer films. It is a fragrant substance that is part of fruit essences and perfume compositions. It is used in the tanning industry as a tannin. It is widely used in the pharmaceutical industry for the separation of primary substances in the production of antibiotics, etc.

KEYWORDS: ether, methanol, hydrolysis, acetic acid, butanol, esterification.

Introduction

Butyl acetate (acetic acid butyl ester) is a colorless liquid with a characteristic odor. Many people find it fruity (pear).

Butyl acetate dissolves cellulose ethers, oils, fats, chlorinated rubbers, vinyl polymers, carbinol resins, etc. Almost everything is the same as acetone, methyl acetate, ethyl acetate. In terms of dissolving power, they are weaker than them, but it has a very important advantage - less volatility and toxicity. The addition of a small amount of butyl alcohol - enhances the dissolving power of butyl acetate.

To obtain butyl acetate, technical acetic acid and synthetic butanol or synthetic rubber production waste (SK butanol) are used

Main Part

Up to 90 % of all butyl acetate produced is consumed by the paint and varnish industry (enamels, paints, varnishes, primers, adhesives). The remaining volume is used in the production of plastics and pharmaceuticals (antibiotics), the food industry.

To obtain butyl acetate, technical acetic acid of any strength and synthetic butanol or synthetic rubber production waste (SK butanol) are used; the latter contains in the form of impurities unsaturated compounds (up to 9 %), hexyl and other alcohols. Less often, more pure fermentation butanol is used.

Also butyl acetate can be done by hydrolysis or speaking.

In simple words, the chemical reaction of hydrolysis can be explained as the decomposition of complex substances under intense exposure to water. In this way, some of the esters are obtained, namely butyl acetate. This substance is a colorless liquid with a characteristic fruity odor. Acetic acid butyl ester, as it is also called, is immiscible with water, but it mixes well with other solvents and hydrocarbons. It is actively used in the paint and varnish industry.

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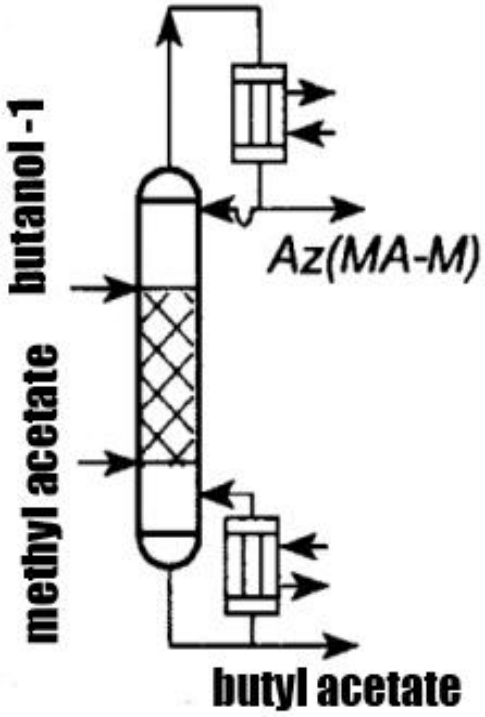
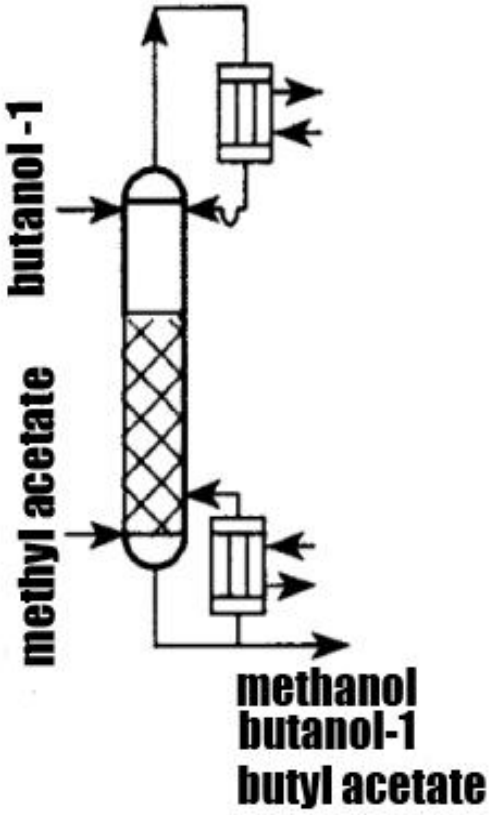
Today, butyl acetate is in great demand in the territory of the Russian Federation, and its demand significantly exceeds supply. This can be explained by the shortage of the main starting reagents for obtaining this substance: butanol-1 and acetic acid. At the same time, during the production of polyvinyl alcohol, such a by-product as methyl acetate is formed, which does not find a better qualified use than in the production of butyl acetate. For this, methyl acetate is hydrolyzed:

$$CH_3 – (CO) – O – CH_3 + H_2O = CH_3COOH + CH_3OH$$

The methanol and acetic acid formed in this reaction can be used in the production of polyvinyl alcohol and vinyl acetate. Also, this process can be implemented in the mode of a continuous combined reaction-rectification process using strongly acidic ion exchangers:

$$CH_3 – (CO) – CH_3 + CH_3CH_2CH_2CH_2OH = CH_3 – (CO) – OCH_2CH_2CH_2CH_3 + CH_3OH$$





To obtain a substance such as butyl acetate, hydrolysis can only be used for methyl acetate. This is because, as a reagent, methyl acetate is preferred over acetic acid, as it is highly corrosive to equipment. Also, the boiling point of acetic acid is 118 ° C, and of methyl acetate - 56.3 ° C, therefore, using methyl acetate, the process can be carried out in lower temperature conditions, which guarantees a longer catalyst (ion exchanger) life.

Due to the analysis of the statics of the reaction-distillation process, several methods have been proposed for the production of butyl acetate by hydrolysis from methyl acetate. Two simplified production schemes are shown in the figure below.

These variants of the production process differ in different conversions of the starting reagents. In the first variant, the conversion of 1-butanol is as much as 100 %, and in the future it will be necessary to separate the azeotropic mixture of methyl acetate with pure methanol. In the second variant, the conversion of methyl acetate is 100 %, and in the future it is necessary to separate the azeotropic mixture of butyl acetate and butanol-1. Also, these schemes are distinguished by complex production processes, and the total amount of costs. Therefore, the final choice should be made only after a detailed technical and economic comparison has been made. It should only be noted that these methods are based on the classical organization of the chemisorption-desorption process.

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