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ACTIVE CATALYSTS FOR PRODUCING VINYL ACETATE MONOMERS

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АКТИВНЫЕ КАТАЛИЗАТОРЫ ДЛЯ ПОЛУЧЕНИЯ ВИНИЛАЦЕТАТНЫХ МОНОМЕРОВ

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АННОТАЦИЯ

В статье исследуется влияние $g\text{-Al}_2\text{O}_3$, высококремнистого цеолита (ЮКЦ), бензонита, керамзита, природы бентонита, пористой структуры, способов приготовления и режимов на активность катализатора, состоящего из ацетата палладия, меди и калия, для парофазный синтез этиленвинилацетата.

ABSTRACT

The article investigates the effect of $g\text{-Al}_2\text{O}_3$, high-silica zeolite (SCZ), benzonite, expanded clay, the nature of bentonite, porous structure, preparation methods and modes on the activity of a catalyst consisting of palladium, copper and potassium acetate for the vapor-phase synthesis of ethylene vinyl acetate.

Ключевые слова: этилен, уксусная кислота, ацетоксилирование, винилацетат, носитель, селективность.

Keywords: ethylene, acetic acid, acetoxylation, vinyl acetate, carrier, selectivity.

Polyvinyl alcohol, after polyvinyl acetate in size, vinyl acetate is used for the production of paints, coatings and water-soluble packaging.

Polyvinyl acetal directly from polyvinyl acetate plays an important role in the production of a safe intermediate layer of glass, insulation of washed soils, coatings and magnetic wires.

Ethylene vinyl alcohol is the fastest growing application of vinyl acetate due to its use as barrier resins for plastic butyls, food packages, tanks for gasoline and technical polymers.

Ethylene vinyl acetate, which, thanks to the packaging industry, continues to grow continuously on the market, and is also used for the production of vapors and shower shoes. In addition, polyvinyl butyral and ethylene vinyl acetate are produced from vinyl acetyl monomer. Polyvinyl butyral helps produce safety raw

materials used in the construction and automotive industry, and vinyl acetate ethylene is widely used to wipe architectural coatings due to low environmental impact. [1.2]

The tasks of the work are:

- Study of methods of vinyl acetate production;
- study of physicochemical bases of vinyl acetate production from ethylene and acetic acid by bugphase method;
- Consideration of main features of process raw materials, as well as product requirements
- Specifics of bifunctional catalysts
- Search for catalysts and technologies and patents for their implementation
- Optimize vinyl acetate production process
- Process Flow Diagram Description
- Accounting of material and heat balances of the reactor

Methods of producing vinyl acetate

The first production process, the reaction of acetic acid and acetylene takes place at a temperature of 170-250 in the gas phase. At the same time conversion of acetylene varies from 60% to 70%, the level of selectivity of acetylene and acetic acid is more than 93%.

Reaction of this method:

Table 1 shows the physical properties of each component.

Table 1.

Physical properties

Component	Molecular Formula	Status	Boiling Point	Liquid Temperature
Acetic acid	CH_3COOH	Colorless liquid	117°C	16,6°C
Acetylene	$\text{HC}\equiv\text{CH}$	Acetylene	-	80,8°C

Component Molecular Formula Boiling Point State
Liquid Temperature

Acetic acid colorless liquid 117 16.6

Acetylene Colorless gas - 80.8

Ruh acetate is an acceptable reaction catalyst, but two auxiliary materials are widely used: carbon and clay beads. The spirit dominates acetate, so it is found less poisonous, cheap and light. Charcoal is a modern retaining material, but the best in terms of mechanical strength, distribution of trunks in size, surface surface is proposed. These are tubular carbon balls. However, in the world this process is used to a lesser extent for economic reasons. Acetylene as a raw material is much higher. This is generally less economically advantageous than using ethylene instead of acetylene.

Synthesis gas

Synthesis gas is a mixture of carbon monoxide, carbon dioxide and hydrogen. It was produced by converting a carbonaceous fuel into a gaseous product.

This product is capable of producing some kind of heat. As an example of synthesis-gas production, coal waste gasification and coke reforming can be mentioned. In this report, esterification with ketene is considered as an example of a synthesis gas method. Acetaldehyde and acetic anhydride are reagents. EDA (ethylenediamine), which has less thermodynamic advantage. Double reaction, it comes back. The reactions are carried out at a temperature of 800 with the participation of the Brensted acid catalyst, in which case acetaldehyde is a synthesis gas. The physical properties of the components for the synthesis gas method are shown in Table 2.

Reactions of this method:

Table 2.

Physical characteristics of reaction products

Component	Molecular Formula	Ҳолати	Boiling Point State	Liquid Temperature
Acetaldehyde	CH_3CHO	Colorless liquid	20,2°C	-123,37°C
Circus anhydride	$(\text{CH}_3\text{CO})_2\text{O}$	Colorless liquid	139,8°C	-73,1°C
Ethylidene diacetate	$\text{CH}_3\text{CH}(\text{CH}_3\text{CO})_2$	Colorless liquid	167°C	18,9°C
Acetic acid	CH_3COOH	Colorless liquid	118°C	16°C

Ethylidenediacetate is involved in both reactions. Since ethyl diacetate is less volatile than acetaldehyde, acetic acid, circus anhydride and vinyl acetate, heating of ethyl diacetate leads to the isolation of acetaldehyde, acetic acid, acetic anhydride and vinyl acetate. To prevent loss of components due to volatility, pressure is increased at high temperatures. These aldol condensations and oligomerization have led to other similar reactions that result in the formation of impractical resin materials. In addition, compared to the third method proposed, material and household costs were higher, however, commodity prices are beneficial.

Process Catalysts

The catalyst plays a crucial role in the technology. Previously, the catalysts were based on palladium absorbed by alkali metal acetates in an amount of 1 to 5 wt. Modern catalysts are used as enhancers of rare earth metals, mainly gold. A typical Bayer type catalyst at spherical frequencies of silica with a diameter of 5 mm consists of 0.15-1.5 wt% Pd, 0.2-1.5 wt% Au, 4-10 wt% COAC. The reaction takes place very quickly and on a partial surface mainly inside the thin layer.

The normal catalyst life is 1-2 years. Optimum operating conditions are temperature around 150-160 and

pressure from 8 to 10 atm. Heated points above 200 lead to constant activation of the catalyst. The mutual ratio of reactants should provide an excess of ethylene in acetic acid of 2:1 to 3:1. Due to the threat of explosion, the oxygen concentration in the reaction mixture should be delayed by 8% less often than in a mixture containing no acetic acid. The above figures describe structural constraints. In addition, less water in the primary mixture may be required to activate the catalyst. [4]

Due to the strong exothermic effect, it is necessary to maintain this temperature increase in order to cool the reaction mixture with some kind of inert gas. Due to selectivity and heat emission limitations, the reactor is designed for one time, usually with a low conversion for 15-35% acetic acid and 8-10% ethylene.

Analysis of the mechanism of the catalytic chemical reaction reveals the main factors that can affect the reactor consultation. At the beginning of 1970, a large similarity of the reaction mechanism in the gas phase with the liquid phase reaction was demonstrated. In this context, a fairly general concept supporting a liquid phase catalyst is adopted, in which the same reaction mechanism can be used to explain both homogeneous and heterogeneous processes. The class of selective

oxidation reactions is a prime example of the presence of acetoethylation.

Under conventional conditions, the adsorption of acetic acid and water in the catalyst may be noticeable, with sulfuric acid forming about three monocells. Promoters generally play an important role in metal acetate. For example, potassium acetate gives water and a salt with a liquid temperature of 148. [4]

As a result, the reaction kinetics are not sensitive to acetic acid concentration from the viewpoint of the reactor structure, but some water is needed to activate the catalyst. In contrast, the complex mechanism of adsorption of ethylene and oxygen is involved in the kinetics of the correspondence reaction. This is confirmed by academic and industrial research. [3]

To obtain vinyl acetate, a vapor-gas method of oxidizing ethylene in a solid catalyst (palladium salt in film) is carried out. In this process, the functions of catalysts and promoters are performed by an inert holder. However, it is necessary to add a business metal cation. The catalyst for the process is palladium acetate formed by reacting palladium with acetic acid.

The reaction mechanism is described in Figure 1.

Figure 1. Reaction mechanism

Due to the dispersion of palladium on the surface of the retainer, direct contact of oxygen with the palladium atom occurs.

In order to develop an active and selective catalyst for the synthesis of BA from ethylene and acetic acid, to control the catalytic properties of the introduced components, the influence of the amount and ratio of individual catalyst components was investigated.

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