

METHODS OF EXTRACTION OF ETHYL MERCAPTAN FROM ORGANOSULFUR COMPOUNDS IN GAS CONDENSATE

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Abstract: The article is based on the use of extractors that select sulfur compounds from gas condensates. Aqueous solutions of sodium hydroxide, ethanolamines, dimethylformamide, diethylene glycol, dimethyl sulfoxide, etc. are offered as extractors. However, none of the extractors currently used meets all the necessary requirements - high solubility compared to sulfur compounds, high density, low viscosity, availability and low cost, lack of toxicity and corrosion properties.

Keywords: Adsorption purification, hydrotreating, gascondensate, gas, ethyl mercaptan, sulfur, extraction purification, odorant.

СПОСОБЫ ИЗВЛЕЧЕНИЯ ЭТИЛМЕРКАПТАНА ИЗ СЕРООРГАНИЧЕСКИХ СОЕДИНЕНИЙ В ГАЗОВОМ КОНДЕНСАТЕ

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Аннотация: Статья основана на использовании экстракторов, которые отбирают соединения серы из газовых конденсатов. Водные растворы гидроксида натрия, этаноламинов, диметилформамида, диэтиленгликоля, диметилсульфоксида и др. предлагается в качестве экстракторов. Однако ни один из используемых в настоящее время экстракторов не отвечает всем необходимым требованиям - высокая растворимость по сравнению с соединениями серы, высокая плотность, низкая вязкость, доступность и низкая стоимость, отсутствие токсичности и коррозионных свойств.

Ключевые слова: Адсорбционная очистка, гидроочистка, газоконденсат, газ, этилмеркаптан, сера, экстракционная очистка, одорант.

Gas condensates are mixtures of various natural gas hydrocarbons, colorless, transparent, mobile; they have a structural composition of the methane series (aliphatic), aromatic (acyclic) and naphthenic (alicyclic). Almost 60-70% of natural gas deposits are located in G. K. depending on the parameters of the mine (T, R and b.) connected. The depth of gas occurrence (150-5500 m), gas movement, pressure, depending on the state of this deposit, G. k. hydrocarbons with this mountain gas are in phase equilibrium in various proportions. So, G. k. it is extracted from gas wells in dissolved form (50-800 g/m³) in various quantities relative to gas.

According to the total sulfur content , gas condensates are divided into 3 groups:

- sulfur-free and low-sulfur containing no more than 0.05% by weight of total sulfur, these condensates are not cleaned from sulfur compounds;

- sulphurous, containing from 0.05 to 0.8% by weight of total sulfur, the need to clean these condensates is solved depending on the requirements for commercial products;

- high-sulfur containing more than 0.8% by weight of total sulfur, purification of such condensates is almost always necessary.

Sulfur compounds in gas condensates are represented by various classes. Light distillates contain mainly aliphatic mercaptans C2 - C5 of normal and isostructure, which have an unpleasant odor. They are extracted from condensates to produce odorants. The heavier fractions contain sulfides (aliphatic, cyclic and aromatic) and thiophenes, represented by alkyl-substituted thiophenes, benzothiophenes, naphthenobenzothiophenes, etc. The presence of sulfur compounds in condensers leads to a deterioration in the thermal stability of the fuels produced from them, increases their corrosive aggressiveness, leads to the release of harmful substances into the atmosphere during the combustion of fuels, gives fuels an unpleasant odor. The most aggressive sulfur compounds are mercaptans. In accordance with modern requirements, the total sulfur content in gasoline should not exceed 0.01% by weight, and the mercaptan sulfur content - 0.001% by weight.

In diesel fuel for high-speed engines, respectively, 0.2% and 0.01%, and for urban diesel fuels, the total sulfur content should be no more than 0.02- 0.05% by weight. in the absence of mercaptans. For jet fuels (RT, TC-1), the total sulfur content should not exceed 0.1- 0.2%, and mercaptan sulfur - 0.001- 0.003%.

Purification of fuel fractions from mercaptans. The main directions of demercaptanization of gas condensates are:

-alkaline extraction of mercaptans followed by the use of light mercaptans as odorants;

-catalytic oxidation of mercaptans to sulfides.

Alkaline extraction of mercaptans is based on the extraction of mercaptans with aqueous solutions of sodium hydroxide to form mercaptides and the reverse reaction - hydrolysis of mercaptides to form free mercaptans and alkali:



The most common process of catalytic oxidation of mercaptans is the "Mercox" process.

The process consists of 2 stages: extraction of alkali-soluble mercaptans with a solution of caustic soda, oxidation of the remaining mercaptans into disulfides with air oxygen. Mixtures of mono- and sulfonated derivatives of cobalt and vanadium phthalocyanine are used as catalysts.

The disadvantages of the process should be noted: multistage, the use of aggressive alkaline solutions requiring the use of special grades of steel, the formation of large amounts of wastewater. At the same time, this process is characterized by high efficiency- the content of mercaptans is reduced to 0.0005% by weight.

Hydrotreating of gas condensates. This process makes it possible to remove all classes of sulfur compounds from gas condensates, as well as other heteroatomic compounds - nitrogen- and oxygen-containing.

The process is based on the conversion of all sulfur compounds dissolved in condensate into hydrogen sulfide:



Aluminum-cobalt-molybdenum and aluminum-nickel-molybdenum are used as catalysts, in which 5-7% silicon dioxide is sometimes added for strength.

The process is carried out at a temperature of 310- 370 0C, a pressure of 2.7- 4.7 MPa, the operating parameters are selected depending on the catalyst and raw materials used.

Adsorption cleaning. Purification from sulfur compounds by this method is carried out using natural and synthetic solid sorbents: bauxite, aluminum oxide, silica gels, zeolites, etc. During adsorption at elevated temperatures of 300-400 ° C, adsorption-catalytic processes occur, leading to the decomposition of organosulfur compounds or their conversion into inactive forms. It is advisable to use adsorption purification with a small sulfur content - up to 0.2% by weight.

Extraction cleaning. The method is based on the use of extractants that selectively extract sulfur compounds from gas condensates. Sodium hydroxide, aqueous solutions of ethanolamines, dimethylformamide, diethylene glycol, dimethyl sulfoxide, etc. are

proposed as extractants. However, none of the extractants currently used meets all the necessary requirements - high solvent capacity in relation to sulfur compounds, high density, low viscosity, availability and cheapness, lack of toxicity and corrosive properties.

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