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# Basic Methods of Regeneration Displacement Desorption

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**Abstract:** The article analyzes methods for restoring the absorption capacity of zeolites for adsorption drying of natural gases and gives recommendations for their improvement.

**Keywords:** liquid hydrocarbons, moisture, carbon dioxide, hydrogen sulfide.

## Introduction.

В последние десятилетия наблюдается тенденция к увеличению добычи и переработки природного газа из числа газоконденсатных месторождений со сложным компонентным составом, содержащим жидкие углеводороды, влагу, углекислый газ, сероводород и серосодержащие соединения, и другие примеси. Содержание воды в газе растёт при увеличении температуры и содержания тяжелых углеводородных компонентов, диоксида углерода, сероводорода и меркаптанов. Даже незначительное количество влаги в газе усиливает коррозию оборудования, особенно при содержании в сырье кислых компонентов, вызывает опасность образования газовых гидратов, снижает калорийность горючих газов. Поэтому одним из основных нормируемых показателей углеводородного газа является его влагосодержание.

## Materials.

The desorption process consists in the separation of adsorbate molecules due to the weakening of adsorption forces, diffusion inside the adsorbent pores to the outer surface, diffusion from the adsorbent surface into the desorbing gas flow, and entrainment from the adsorbent layer. Depending on the conditions of the desorption process, any of the indicated elementary acts can limit the overall rate of the process.With the continuous movement of the zeolite in the apparatus and under certain process parameters (velocity of the zeolite, the velocity of the steam-gas flow, the concentration of water vapor in the flow), adsorption of water vapor occurs in the frontal layer of the zeolite and desorption of the target components adsorbed in the middle and trailing parts of the layer. [1].

To create the required concentration of water vapor in the steam-air flow, the purified air was saturated in the humidification unit. The initial concentration of CO2 was created by diluting concentrated CO2 coming from the cylinder; the concentration of benzene and alkanes vapors of a normal structure in a stream of dry air was created by evaporating these substances in a temperature-controlled "goose". A continuously moving zeolite layer was regenerated in a column apparatus with an average residence time of the adsorbent in the apparatus equal to 4 hours or more (depending on the speed of movement of the zeolite in the apparatus), at a bed temperature of 400 °C in a stream of air heated to 350-400 °C with a dew point (-60) h-(-70) ° C, supplied by a countercurrent at a speed of 0.025 m / s. [1,2].

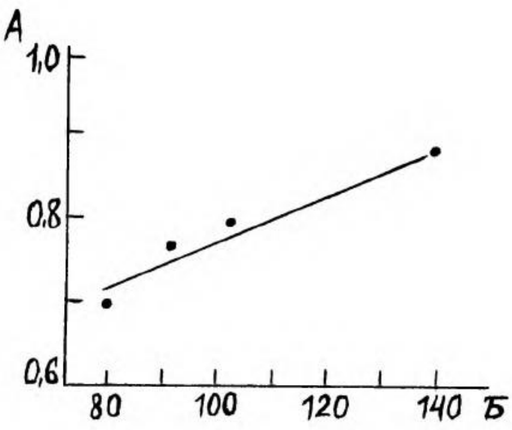
| The speed of movement of the zeolite in the apparatus, cm / h | Initial concentration of water vapor in the gas stream, mg/l | Initial CO2 concentrati on in the gas stream, %(объемн.) | The degree of filling of the adsorption space with water vapor, %(масс.) | Degree of displacement, % (wt.) |
|---|---|---|---|---|
| 9,5 | 7,5 | 5,0 | 96,0 | 99,98 |
| 9,8 | 7,5 | 5,0 | 92,0 | 99,70 |
| 10,2 | 7,5 | 5,5 | 88,0 | 99,55 |
| 13,6 | 8,0 | 5,4 | 71,0 | 99,35 |
| 15,9 | 8,0 | 4,6 | 61,0 | 98,55 |

Table 1. Displacement desorption of CO2 from NaA zeolite by water vapor (steam-air flow velocity w - 0.5 m/s)

Desorbed benzene, normal alkanes, and water were condensed in three condensers connected in series: the temperature was maintained at minus 23°C in the first one, and minus 75°C in the second and third. The amounts of desorbed components were determined from the volume of the condensate; the amount of desorbed CO2 was found by graphical integration of the area bounded by the curve of change in CO2 concentration in the gas flow during desorption. [1,3].

The change in the degree of CO2 displacement depending on the filling of the adsorption space of the NaA zeolite with water vapor is given in Table 1, from which it follows that when the adsorption space is filled with water vapor by 61%, the degree of CO2 desorption at a gas flow temperature of 20 °C reaches 98, 5%, and at 96% filling of the adsorption space - 99.98%.[2].

The results of studying the low-temperature desorption of normal alkanes (hexane, heptane, octane and decane) from NaX zeolite by water vapor at a carrier gas velocity of 0.344 m/s are given in.




Change in the degree of filling of the adsorption space of the NaX zeolite with water vapor depending on the molecular weight of normal alkanes during their complete desorption:

A -is the degree of filling the adsorption space of the zeolite with water vapor.

B- is the molecular weight of normal alkanes

**Methods**

As an exception, sometimes, for example, in the processes of separation of high-molecular-weight hydrocarbons, the method of desorption by a worse adsorbing substance is used. In this case, the desorbent acts as a dynamic agent, lowering the partial pressure of the adsorbate, and is simultaneously sorbed on adsorbents, gradually displacing hydrocarbons from them. Desorbent hydrocarbons are easily displaced in subsequent dewaxing steps. Thus, when developing the stage of displacement desorption, it should be remembered that the desorbent must not only effectively displace the adsorbate, but also be easily removed later on. This method is used for adsorption processes carried out on zeolites. The increased adsorption activity of zeolites for water vapor makes it possible to use it as an ideal displacing component (desorbent) at relatively low temperatures. [1].

**Results.**

Thus, the research results show that the method of low-temperature desorption using a water vapor displacer as a component makes it possible to isolate target components from zeolites in a continuous way, and the process of restoring the adsorption properties of zeolites with respect to target components can be reduced to the process of thermal desorption of water vapor from zeolites, using as a coolant, for example, combustion products of gaseous fuel.

**Conclusion.**

In the experimental process, the zeolite is regenerated in the ampoule, and as the frequency of the amount of desorbed water increases, the power of the zeolite is increased. Electric furnace with heating of the adsorbent and regeneration of the adsorbent at any temperature in the range of 20...400°C. Regeneration can be provided both at atmospheric pressure and at a pressure reduced to 1 Pa.

**References:**


1. ТИЛЛАЕВА Ш.Ф., ШАРИПОВ К.К. Совершенствование метода восстановления поглощаемой способности цеолитов для адсорбционной осушки природных газов. МОНОГРАФИЯ. 2022.
2. Сайпуллаев, Ф. С. Регенерация отработанного синтетического цеолита CaA и его характеристика / Ф. С. Сайпуллаев, Р. Р. Хайитов. Текст: непосредственный // Молодой ученый. — 2015. — № 8 (88). — С. 298-301.
3. Shakhnoza Tilloeva. MECHANISM FOR OBTAINING IMPORTED SUBSTITUTE ODORANT BASED ON DOMESTIC RAW MATERIALS.Universium. Май 2023. P-37-40.