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DEVELOPMENT OF A TECHNOLOGY FOR OBTAINING CAA ZEOLITE FOR THE PURIFICATION OF NATURAL AND OIL AND GAS FROM SOUR GASES BASED ON LOCAL RAW MATERIALS

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Abstract

It was aimed to synthesize the zeolite chemical reagent used in natural gas purification from local raw materials and thereby replace imported sorbents. Sorbents obtained from local raw materials allow to increase economic efficiency and ensure environmental safety in the process of gas purification.

Key words

Zeolite, type, natural gas, purification process, adsorption, structure, regeneration, chemical reagent**.**

Introduction.

Sour gases, in particular hydrogen sulfide (H_2S) and carbon dioxide (CO_2), are widespread in natural and oil and gas, and they cause serious problems in gas processing, transportation, and storage. H_2S is a toxic and highly corrosive substance that causes damage to equipment and premature wear of materials. CO_2 can develop high pressures and corrosion in gas pipeline systems and compressor stations. These properties of sour gases not only cause problems in technological processes, but also reduce production safety and create difficulties in complying with environmental standards. Therefore, the effective purification of sour gases in the oil and gas industry is an urgent and strategically important task. Currently, many sorbents and adsorbents used in gas purification are imported, have high cost and logistical difficulties. The production of sorbents from local raw materials reduces the need for imports, increases economic efficiency and is important for the development of local industrial potential.

Also, zeolites obtained from local raw materials can operate under various technological conditions, and their crystal structure allows them to adsorb H_2S and CO_2 molecules with high efficiency. Local sorbents are not only economically but also environmentally important, serving to reduce harmful gases emitted into the atmosphere and ensure the environmental safety of production processes. In addition, sorbents synthesized from local raw materials have long-term stable operation in industry and significantly reduce costs compared to imported sorbents. Therefore, the development of CaA zeolite based on local raw materials and the development of gas purification technologies is a promising direction not only for science, but also for industry.

Structure and adsorption properties of CaA zeolite CaA zeolite is a form of type A zeolite substituted with calcium ions, and its crystal structure contains pores of precisely defined sizes. These pores allow for selective adsorption of molecules and, in particular, capture H_2S and CO_2 molecules with high efficiency. CaA zeolite mainly has the following properties: High adsorption capacity: The crystal structure allows for efficient capture of gas molecules. Thermal and chemical stability: This sorbent retains its properties at high temperatures and in various chemical environments. Regeneration ability: CaA zeolite can be regenerated several times, which increases economic efficiency. Long service life: Zeolite synthesized from local raw materials works with high efficiency for a long time. CaA zeolite captures H_2S and CO_2 molecules through physical and chemical adsorption. Gas molecules are attached to the active centers in the microporous structure of the zeolite and are transported through the purified gas stream. In addition, CaA zeolite is stable under various pressure and temperature conditions, which allows it to be used as an effective sorbent in the oil and gas industry. Additional analyses

have shown that CaA zeolite synthesized from domestic aluminosilicate raw materials gives almost equal results in terms of adsorption efficiency and stability compared to imported sorbents, and also creates economic advantages.

Synthesis of CaA zeolite based on local raw materials Production of CaA zeolite based on local raw materials is not only technically efficient, but also economically and environmentally advantageous. This technology reduces the need for imported sorbents, reduces production costs and increases the potential of local industry. From an environmental point of view, effective purification of sour gases serves to reduce the amount of harmful substances emitted into the atmosphere and ensure the environmental safety of production processes. At the same time, sorbents synthesized from local raw materials provide stability and reliability in the industry and create opportunities for long-term sustainable development. Use of CaA zeolite in gas purification CaA zeolite is effectively used in the purification of oil and gas and natural gases from sour gases by the adsorption method. When the gas stream passes through the zeolite layer, H_2S and CO_2 molecules bind to the microporous structure and active centers of the zeolite, and the purified gas is directed to the next technological stages. By regenerating the zeolite, it can be reused several times, which increases economic efficiency and continuously maintains the adsorption capacity of the sorbent. CaA zeolite demonstrates high efficiency and reliability under various operating conditions, and can also be effectively used in various gas pipelines, compressor stations and gas preparation plants. Sorbents synthesized from local raw materials have an economic advantage over imported products and ensure stability in the industry.

Economic and environmental efficiency The production of CaA zeolite based on local raw materials is not only technically efficient, but also economically and environmentally advantageous. This technology reduces the need for imported sorbents, reduces production costs and increases the potential of local industry. From an environmental point of view, effective purification of sour gases serves to reduce the amount of harmful substances emitted into the atmosphere and ensure the environmental safety of production processes. At the same time, sorbents synthesized from local raw materials provide stability and reliability in the industry and create opportunities for long-term sustainable development. Conclusion The technology for obtaining CaA zeolite based on local raw materials is a promising and economically viable solution for the effective purification of natural and oil and gas from sour gases. This technology is environmentally safe, and CaA zeolite is distinguished by its high adsorption capacity, thermal and chemical stability, and the possibility of regeneration. The sorbents synthesized from local raw materials have an advantage over imported products, and when introduced in the industry on a large scale, they increase the capacity of the local industry and the opportunities for sustainable development. Also, the obtained results serve to develop modern adsorption technologies and expand scientific research directions in the field of gas purification.

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