

PURIFICATION OF NATURAL AND TECHNOLOGICAL GASES FROM ACID COMPONENTS USING METHYLDIETANOLAMINE AND METHYL ESTERS

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ANNOTATION: In this article, methyl ethanolamine methyl esters, the purification of natural and technological gases from acidic components using active centers, important parameters for the production of MDEA from ethylene oxide (EO) and methylamine (MA), the kinetics of obtaining methyl alcohol esters (MSE) from ethylene oxide (EO) and methanol, and the influence of the selected catalyst on the MDEA yield are studied, and the schemes and reactions for MDEA synthesis from ethylene oxide (EO) and methyl amine (MA) are presented. Considering that the need for modern means of purification from acidic components is increasing year by year, the article presents methods for the production process of MDEA and methyl alcohol esters.

KEY WORDS: methyldiethanolamine MDEA, methyl alcohol esters MSE, ethylene oxide EO, methyl amine MA, hydrogen sulfide, carbon dioxide, methylmonoethanolamine MMEA, ethoxylated MDEA.

АННОТАЦИЯ: В данной статье изучены метиловые эфиры метилэтанолamina, очистка природных и технологических газов от кислых компонентов с использованием активных центров, важные параметры производства МДЭА из этиленоксида (ЭО) и метиламина (МА), кинетика получения метиловых спиртовых эфиров (МСЭ) из этиленоксида (ЭО) и метанола, а также влияние выбранного катализатора на выход МДЭА, и представлены схемы и реакции синтеза МДЭА из этиленоксида (ЭО) и метиламина (МА). Учитывая растущую потребность в современных средствах очистки от кислых компонентов, в статье представлены методы производства МДЭА и метиловых спиртовых эфиров.

КЛЮЧЕВЫЕ СЛОВА: метилдиэтаноламин (MDEA), сложные эфиры метилового спирта (MSE), этиленоксид (EO), метиламин (MA), сероводород, диоксид углерода, метилмоноэтаноламин (MMEA), этоксилированный MDEA.

INTRODUCTION: In the largest industrial sectors, such as gas, oil refining, nitrogen, and metallurgy, gas is purified from harmful substances. Mainly, natural and industrial gases are purified from substances such as hydrogen sulfide, carbon dioxide, mercaptans, carbon sulfide, and carbon disulfide [1].

When purifying hydrogen sulfide, carbon dioxide, and other impurities from natural and industrial gases, gases are purified with aqueous solutions of amines [2]. The purification process with amine solutions is based on the chemical interaction of H₂S and CO₂ with the active component of the absorbent. Recently, methyl diethanolamine (MDEA) -based absorbers have many advantages over existing monoethanolamine and diethanolamine-based composite dust absorbers, as well as mixed absorbers; MDEA removes other impurities from gases due to its good solubility in chemical components [3].

Due to the fact that, in addition to MDEA, methyl alcohol esters (MSE) have achieved high efficiency in natural gas purification, the demand for MDEA and methyl alcohol esters (MSE) is increasing year by year. These products are not produced everywhere in the world, so research is being conducted to create technologies for the synthesis of MDEA and methyl alcohol esters (MSE) [4].

It is very important to purify gases, primarily hydrogen sulfide and carbon dioxide. The development of industrial technologies for the production of MDEA and methyl alcohol esters (MSE) is relevant.

"Modern methods for purifying gases from hydrogen sulfide and carbon dioxide" were considered at scientific and production seminars. "Current State and Ways to Solve Environmental Protection Problems in Oil and Gas" are reported in the programs [5].

DISCUSSION: When new methods for producing MDEA from ethylene oxide (EO) and methylamine (MA) were developed, the introduction of an active

center compared to MDEA helped improve the absorption process. The technology achieves high energy efficiency, high stability, and safety.

If a new technology is developed for the synthesis of methyl alcohol ethers (MSE) from ethylene oxide and methanol with primary production of methyl triethylene glycol, the absence of pressure in the synthesis unit, low synthesis temperature, separation from the reaction mixture, low consumption coefficients for raw materials, low metal consumption, and high-quality gas will be obtained, and economic efficiency will be achieved.

MDEA and methyl alcohol esters (MSE), obtained using the technologies described in the work, are used as a new generation of dust-absorbing agents for purifying natural and industrial gases from acidic impurities. New sorbents, competitive in quality and price, are widely used in the gas, oil refining, and nitrogen industries. The use of MDEA and methyl alcohol esters (MSE) ensures a high level of energy conservation at the enterprise.

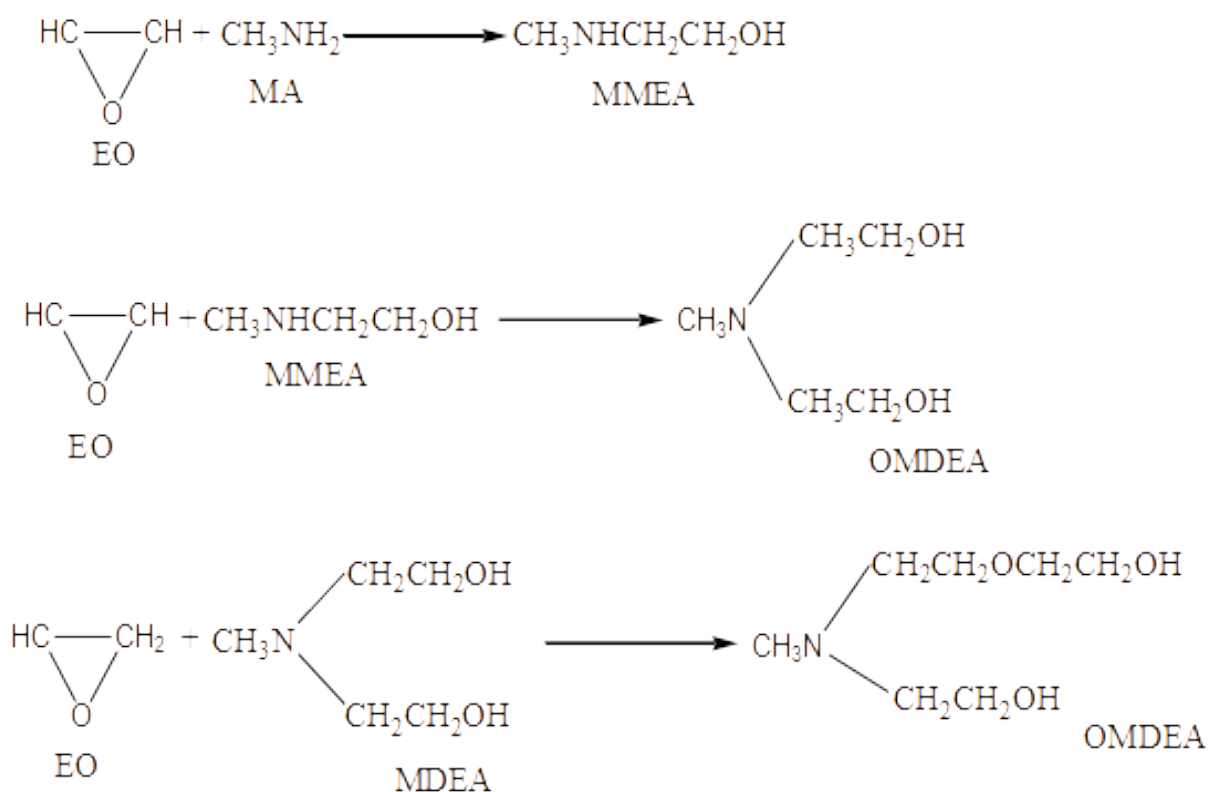
RESULTS: Important parameters for the production of MDEA from ethylene oxide (EO) and methylamine (MA) were studied. Velocity and energy constants were studied experimentally, and the composition of side reactions was sufficiently considered. A mathematical model for the synthesis of MDEA has been proposed.

The kinetics of obtaining methyl alcohol ethers (MSE) from ethylene oxide (EO) and methanol were studied, and the influence of the selected catalyst MDEA on the yield of the process was studied. The selectivity and speed of the process were determined in laboratory work based on the ratio of reagents, reaction temperature, and catalyst concentration, and high results were achieved. Values of rate constants were obtained for reactions forming methyl alcohol ethers (MSE) and the activation energies of the reactions were determined. A mathematical model for the synthesis of methyl alcohol ethers (MSE) from ethylene oxide (EO) and methanol has been developed, and a new technology for the synthesis of methyl alcohol ethers (MSE) with primary production of methyltriethylene glycol has been developed.

Considering that the industry's demand for modern domestic dust-absorbing agents is increasing every year, the production methods of MDEA and methyl alcohol esters (MSE), as well as the conditions and mechanisms of interaction between ethylene oxide (EO) and alkylamines and hydroxyl-containing compounds, lead to a significant increase in the absorption process yield.

To obtain MDEA, the following reaction experiments were conducted in the laboratory.

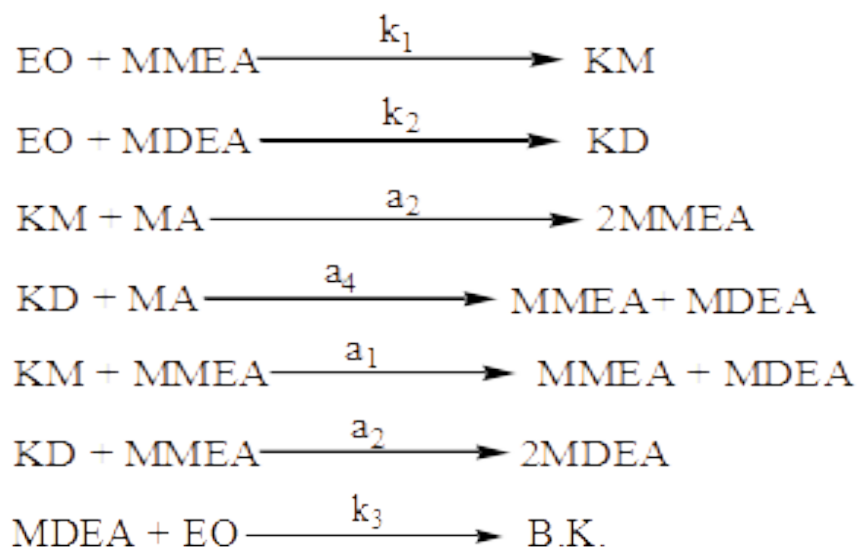
The synthesis of MDEA from EO and MA proceeds according to the following scheme:



In the first reaction, methylmonoethanolamine (MMEA) is formed, in the second, MDEA, and in the third, the byproduct is ethoxylated MDEA (OMDEA). Laboratory experiments serve as the basis for studying the kinetics of the MDEA production process.

The conducted research showed that the MDEA production process is represented by a model that considers the interaction of EO and MA in accordance with the theory of activated complexes.

The diagram of the interaction between EO and MA is presented in the following form:



where KM is the active complex of EO and MMEA; KD-active complex EO and MDEA B.K high-temperature boiling products (e.g., OMDEA); k_1 , k_2 -constant velocity constants for the active complex, k_3 constant velocity constants for the constant product, a_1 a_2 a_3 a_4 MA and MMEA with activated complex velocity constants.

When developing the kinetic model of the process, assumptions were made regarding the reaction of EO and MA without the use of catalysts such as MMEA and MDEA:

The stages of formation of complexes activated by EO are limited—MA and MMEA reactions, where the consumption rate constants of active complexes are significantly greater than their formation constants; an adequate characterization of the impurity formation reaction—OMDEA—was adopted, as this reaction has a different nature and, as is known, the rate constant k_3 is significantly lower than k_2 .

CONCLUSION: As a result of the conducted research, important parameters for the production of MDEA from ethylene oxide (EO) and methylamine (MA) were studied. A scheme for the synthesis of MDEA from EO

and MA was developed, and laboratory testing of the obtained results allowed for a high-efficiency purification of natural and industrial gas from acidic components.

LIST OF USED LITERATURE

1. Eltermon V.M. Protection of the air environment at chemical and petrochemical enterprises. - M., 2000.
2. Mukhametgaliyev I. M. et al. Cleaning of gases from acidic components // Bulletin of the Kazan Technological University. – 2017. – Vol. 20. – No. 3.
3. Tursunov B. J., Gaybullaev S. A., Jumaev K. K. Influence of technological parameters on gas glycolysis drying // MEDICAL SCIENCES. - 2020. – Vol. 1. – No. 55. - P. 33.
4. Report on NIR "Oil and Gas Industry Development Program until 2045," JSC "O'ZLITINEFTGAZ" 2020.
5. "Permanent technological regulations for the operation of the 'Uchkir' sulfur cleaning plant," Gazli NGDU, 2019.