SIR Publishers
CENTER FOR INTERNATIONAL
SCIENTIFIC PUBLICATIONS
JOURNAL OF CHEMISTRY
ISSN(Online): 2984-8075
SJIF Impact Factor |(2023): 5.72|
Volume-7, Issue-10, Published |20-10-2024|

YER OSTI QATLAMLARIDAN QAZIB OLINADIGAN GAZLAR XUSUSAN, VODOROD SULFIDNING XUSUSIYATLARI VA AHAMIYATI.

https://doi.org/10.5281/zenodo.14051052

Fayziyev Xayrullaxon Omonilloyevich
Military serviceman of the Ministry of Defense, freelance researcher of chemical sciences fayziyevxayrullaxon@gmail.com
Ismatov Ikromjon Parpiyevich
Military serviceman of the Ministry of Defense
Axmedov Rafael Madraximovich
Military serviceman of the Ministry of Defense
Oxunov Lochinbek Yusupovich
Military serviceman of the Ministry of Defense

ANNOTATSIYA

Ushbu manbaada yer osti qatlamidan qazib olingan gazlar tarkibini oʻrganish asosida oltingugurt mavjudligi hamda uning miqdoriga bogʻliq holda tozalash usuli tanlangan. Bunda absorbsion usul tanlanib, unda ishlatiladigan absorbentlarning qoʻllanilishi texnologik tizimi qisman bayon qilingan. Shu jumladan ushbu oltingugur birikmasi boʻlgan H_2S ning hosil boʻlishi, uning umumiy maʼlumotlari va sharxi, zararli taʼsiri hamda unga nisbatan eng yuqori sezuvchanlikka ega boʻlgan kasallik turlarining ayrimlari haqida qisman maʼlumotlar keltirilgan.

Kalit soʻzlar:
Gaz qatlamlari, ionlanish, mudofaa, xalqaro, vodorod sulfid, DEA, MDEA, Genri qonuni, burgʻulash, tozalash, reaksiya, miqdor, astma, sifat.

АБСТРАКТНЫЙ

В этом источнике на основе изучения состава газов, извлекаемых из пласта, метод очистки был выбран в зависимости от наличия серы и ее количества. При этом выбран метод абсорбции и частично описана технологическая система использования используемых в нем абсорбентов. Сюда входит общая информация и обзор образования этого соединения серы, H_2S, его вредного воздействия, а также частичная информация о некоторых заболеваниях, к которым оно наиболее чувствительно.

Ключевые слова:

Газовые пласты, ионизация, оборона, международный, сероуглерод, сероводород, ДЭА, МДЭА, закон Генри, бурение, очистка, реакция, количество, астма, качество.

PROPERTIES AND IMPORTANCE OF UNDERGROUND GASES, PARTICULARLY HYDROGEN SULPHIDE.

ANNOTATION

In this source, based on the study of the composition of gases extracted from the layer, the method of purification was chosen depending on the presence of sulfur and its amount. In this case, the absorption method is selected, and the technological system of the use of absorbents used in it is partially described. This includes general information and an overview of the formation of this sulfur compound, H_2S, its harmful effects, and partial information on some of the diseases to which it is most sensitive.

Keywords:

Gas layers, ionization, defense, international, carbon sulfide, hydrogen sulfide, DEA, MDEA, Henry's law, drilling, cleaning, reaction, quantity, asthma, quality.

Within the framework of the decision of the President of the Republic of Uzbekistan Shavkat Mirziyoyev dated March 9, 2017 "On approval of the program to increase the production of hydrocarbon raw materials in 2017-2021", in recent years in our country, the main focus has been on the production of natural and released gases in the enterprises of the oil and gas processing industry. certain results are being achieved in the improvement of cleaning technologies from sulfur-containing organic compounds, mercaptans, carbonyl sulfide (COS), carbon (IV) oxide, carbon disulfide (CS_2) and sulfide ethers (RSR), as well as creation and purification technologies of highly effective new composite absorbents for gas purification. During alkaline cleaning, hydrogen sulfide and mercaptans are absorbed by an aqueous solution of sodium hydroxide (it is cheaper than potassium hydroxide):

$H_2S + 2NaOH \rightarrow Na_2S + 2H_2O$ (1.)

$H_2S + NaOH \rightarrow NaHS + H_2O$ (2)

$RSH + NaOH \rightarrow RSNa + H_2O$ (3)

The resulting solution of sulfide and hydrosulfide requires neutralization. Decontamination methods include interaction with suspended divalent and trivalent iron hydroxides. The absorption solution is regenerated by passing air through it. About 70% of hydrogen sulfide is transferred to elemental sulfur, and 30% is oxidized to sodium thiosulfate [1].

Selection of an absorbent for a technological process.

When choosing an absorbent absorbent for a technological process, absorbents are selected depending on the composition of the processed gas, pressure and temperature conditions, and its composition in relation to major and minor components. It should also be considered whether simultaneous removal of H_2S and CO_2 or selective absorption of H_2S is advantageous. Although there is no perfect solution to provide optimal operating conditions in any application, there is sufficient information and experience with several alkanolamines to provide a reasonable choice of treatment solution for a wide range of conditions. In many cases, process requirements can be met with different amines and an economic analysis is required.

Monoethanolamine For many years, aqueous solutions of monoethanolamine, which have been used almost exclusively for the removal of H_2S and CO_2 from natural and some synthesis gases, are rapidly being replaced by other, more efficient systems, especially for the treatment of high-pressure natural gases. However, monoethanolamine is still the preferred solvent for cleaning gas streams, contains relatively low concentrations of H_2S and CO_2, and is substantially free of minor contaminants such as CO_2 and CS_2. This is especially true when the gas needs to be treated at low pressures and maximum removal of H_2S and CO_2 is required. Monoethanolamine's low molecular weight, resulting in high solvation capacity at moderate concentrations (by weight), its high alkalinity, and relative ease of recovery from contaminated solutions are in many cases advantages that more than balance its inherent disadvantages. Among the latter, the most serious is the presence of a significant amount of these compounds in the gas, which leads to excessive chemical losses.

Formation of irreversible reaction products with CO_2 and CS_2. In addition, monoethanolamine solutions are significantly more aggressive than other amine solutions, especially when the amine concentration exceeds 20% and the solutions are heavily loaded with acid gas. This property limits the possibilities of monoethanolamine solutions in cases where the high partial pressure of acid gases allows for a significant increase in loads. However, some systems using effective corrosion inhibitors have been reported to overcome these limitations. Such systems include Dow's FT-1 gas technology and UOP's Amine Guard, suitable for removing CO_2 from ammonia and plant hydrogen as well as sweet natural gas streams. In general, corrosion inhibitors are effective in CO_2 removal systems, increasing MEA concentrations up to 30%. However, they have not proven reliable in preventing corrosion with CO_2/H_2S mixtures. are high heats of reaction with CO_2 and H_2S (about 30% higher than DEA for both acid gases). This results in high energy consumption for cleaning in MES systems. Finally, the relatively high vapor pressure of monoethanolamine results in significant evaporation losses, especially when operating at low pressures. However, this difficulty can be overcome by simply washing the purified gas with water [2].

Hydrogen sulfide (H_2S; CAS No. 7783-06-4) is also known as hydrosulfuric acid, hydrogen sulfuric acid, hydrogen sulfide, liver gas, stench, sulfur hydride, hydrogen sulfide, dihydrogen monosulfide, dihydrogen sulfide, and sewer gas. Its structural formula is described as H-S-H. Hydrogen sulfide is a colorless, flammable gas that smells like rotten eggs. The relative molecular mass of hydrogen sulfide is 34.08. The vapor pressure at 21.9 °C is 1929 Pa. Soluble in water; Solubility in water at 20 °C is 1 g in 242 ml. The taste limit of hydrogen sulfide in water is from 0.05 to 0.1 mg/liter (WHO, 1993). Hydrogen sulfide is also soluble in alcohol, ether, glycerin, gasoline, kerosene, crude oil, and carbon disulfide. The Henry's Law constant at 20 °C is given in ATSDR (1999) as a fraction of 468 atm/mol. Other physical and chemical properties can be found in the International Chemical Safety Data Sheet (ICSC 165) referenced in this document.

The conversion factors 1 for hydrogen sulfide in air (20 °C, 101.3 kPa) are:

$1\ mg/m^3 = 0{,}71\ ppm$

$1\ ppm = 1{,}4\ mg/m^3$

Hydrogen sulfide occurs naturally and as a result of human activity. Natural sources account for approximately 90% of the total hydrogen sulfide in the atmosphere (US EPA, 1993). Hydrogen sulfide is produced naturally by the nonspecific and anaerobic bacterial reduction of sulfates and sulfur-containing organic compounds (Hill, 1973). It is mainly released as a gas and is found naturally in crude oil, natural gas, volcanic gases and hot springs. Hydrogen sulfide is also found in groundwater (OSU, 2001). Hydrogen sulfide is released from stagnant or polluted waters and manure or coal pits with low oxygen content. Hydrogen sulfide is released by some plant species as a byproduct of sulfite metabolism (Wilson et al., 1978; Takemoto et al., 1986). The terrestrial emission rate of hydrogen sulfide is 53 to 100 million tons of sulfur per year (Hill, 1973). Emission rates from the oceans range from 27 to 150 million tons of sulfur per year (Hill, 1973).

Sample risk description

In the United States, atmospheric concentrations of hydrogen sulfide range from 0.14 to 0.4 mg/m^3 (US EPA, 1993). These levels are well below the short-term and medium-term acceptable concentrations of 100 and 20 mg/m^3, respectively. The general population may be exposed to hydrogen sulfide from accidental releases from natural gas wells during drilling near residential areas (Layton &

Cederwall, 1986; Leahey & Schroeder, 1986). Maximum ground-level concentrations of hydrogen sulfide downwind of two sour gas well blowdowns were estimated to be 2.8 and 20 mg/m³. Workers have been occupationally exposed to hazardous levels of hydrogen sulfide from fermented manure (Morse et al., 1981) or stagnant wells (McDonald & McIntosh, 1951), as well as in poorly ventilated areas of wastewater treatment plants (NIOSH, 1984, 1985a, 1990). can hide. Extruded rubber plants (NIOSH, 1985b) and oil refineries (NIOSH, 1982a, 1982b). Hydrogen sulfide levels were reported to be >310 mg/m³ in a stalled well; 70-280 mg/m³ in open service ports at the oil refinery; and >700 mg/m³ in a wastewater treatment plant. The recommended exposure limit (REL) for hydrogen sulfide in the US is currently 14 mg/m³ for 10 minutes (NIOSH, 1997).

The environmental impact of malodorous emissions is usually a mixture of sulfur-containing gases. The exact concentration of hydrogen sulfide in these types of mixtures cannot be determined. There is also uncertainty about the dose and duration of exposure when assessing exposure. Based on limited data, rodents are less sensitive to hydrogen sulfide than humans. Because the respiratory tract is the primary target organ of hydrogen sulfide toxicity, individuals with asthma, the elderly, and young children with impaired respiratory function are susceptible subpopulations. **A LOAEL of 2.8 mg/m³ for bronchial congestion in 2 out of 10 asthmatics in Jappinen et al. (1990) study was chosen as the basis for deriving the short-term tolerable concentration.** Three out of 10 subjects complained of headache after exposure. The subjects of the study had asthma and took medication for 113 years. Patients with severe asthma were not included in the study because study subjects were required to stop taking their medication 2 days prior to exposure. Subjects were exposed for 30 minutes in the exposure chamber. Asthmatics represent a susceptible population and the route of exposure is relevant.

This study is limited by the small number of study subjects, lack of replication, and lack of clear clinical symptoms. However, it should be noted that exposure to high concentrations of hydrogen sulfide is not positive for severe asthmatics. Bhambhani & Singh (1991) and Bhambhani et al. (1996b, 1997) demonstrated metabolic effects in young healthy volunteers exposed to 7 mg hydrogen sulfide/m³ for 30 minutes. However, the exposure pathway used by Bhambhani & Singh (1991) and Bhambhani et al. (1996b, 1997) by oral inhalation. The subjects could not smell the hydrogen sulfide and their eyes were not open. Therefore, this LOAEL was not used as a basis for deriving a short-term tolerable concentration. The short-term tolerable concentrations obtained from the two studies are not significantly different.

Because of the serious toxic effects associated with exposure to high concentrations of hydrogen sulfide for very short periods of time, all exposures should be avoided. No human toxicity data are available on intermediate or long-term exposure to low levels of hydrogen sulfide. This type of data is a priority for assessing the health risks of exposure to hydrogen sulfide for residents living near hazardous waste sites and other potential sources of hydrogen sulfide, such as hot springs and wastewater treatment plants [3].

Hazardous properties of H_2S gas

Hydrogen sulfide is heavier than air and can travel through the earth. It accumulates in low and closed, poorly ventilated areas such as basements, hatches, sewer pipes, underground telephone vaults and manure pits. The main route of exposure is inhalation and the gas is rapidly absorbed by the lungs. Absorption through the skin is minimal. People can smell the "rotten egg" smell of hydrogen sulfide in the air at low concentrations. However, with continued low-level exposure or high concentrations, a person loses the ability to smell even though the gas is still present (acute fatigue). This can happen very quickly and at high concentrations, and the ability to smell the gas can be lost instantly. Therefore, do not rely on your sense of smell to indicate the presence of hydrogen sulfide or to warn of dangerous concentrations. Furthermore, hydrogen sulfide is a highly flammable gas and gas/air mixtures can be explosive. It can go to sources of ignition and back. If ignited, the gas will burn and produce toxic fumes and gases such as sulfur dioxide.

High concentrations can cause shock, convulsions, difficulty breathing, very rapid unconsciousness, coma, and death. Effects may occur over several puffs and possibly in a single puff. Contact with liquid hydrogen sulfide causes frostbite. If clothing becomes wet with liquid, avoid sources of ignition, remove clothing and isolate in a safe place to allow liquid to evaporate.

Health changes due to H_2S exposure:

Hydrogen sulfide is both an irritant and a chemical asphyxiant, affecting oxygen use and the central nervous system. Its health effects may vary depending on the level and duration of exposure. Repeated exposure may cause health effects at levels previously taken without any adverse effects. Low concentrations are irritating to the eyes, nose, throat, and respiratory system (eg, eye burning/tearing, coughing, shortness of breath). Asthmatics may have difficulty breathing. When working at low concentrations, effects can be delayed for hours or sometimes days. Repeated or long-term exposure may cause eye inflammation, headache, fatigue, irritability, insomnia, digestive disturbances, and weight loss. Moderate concentrations may cause severe eye and respiratory tract irritation (including coughing, difficulty breathing, fluid accumulation in the lungs), headache, dizziness, nausea, vomiting, agitation, and agitation.

Protection against H_2S exposure Before entering areas where hydrogen sulfide may be present:

1. The air should be tested for the presence and concentration of hydrogen sulfide by a qualified person using air monitoring equipment such as hydrogen sulfide detection tubes or a multi-gas meter that detects the gas. The test should also determine if fire/explosion measures are required.

2. If gas is present, the space/area must be continuously ventilated to remove the gas.

3. If it is not possible to remove the gas, the person entering the space/area must use appropriate respiratory protection and any other personal protective equipment, rescue and communication equipment.

Exposure to Hazardous H_2S Atmospheric levels of H_2S of 100 ppm or greater are immediately dangerous to life and health. Entry into the affected atmosphere may only be accomplished using: 1) a self-contained breathing apparatus (SCBA) with a minimum service life of thirty minutes, or 2) a self-contained breathing apparatus (SCBA) with an auxiliary device providing a full face pressure requirement air respirator and independent air supply. If the H_2S level is below 100 ppm, an air-purifying respirator may be used, assuming a suitable hydrogen sulfide filter cartridge / canister. A full-face respirator prevents eye irritation. If air concentrations rise, eye irritation can become a serious problem. If a half-mask respirator is used, tight-fitting goggles should also be used. Workers in areas with hydrogen sulfide should be observed for signs of overexposure.

Never attempt a rescue in an area where hydrogen sulfide may be present without wearing appropriate respiratory protection and training in such rescues [4].

Experimental studies of regeneration of saturated with amine solutions confirm that addition of PEGE to DEA, MDEA or their mixture accelerates the desorption process of acidic components. A 5% addition of PEGE reduces the content of H_2S in the absorbent by 5-7% after 60 minutes of regeneration, and a 10% addition of PEGE - by 15-20%.

Table 1

Real and calculated indicators of gas cleaning process with MDEA solution (temperature of amine in plate 25/15 - 40/60 °C) are presented.

Parameter	One. size	Pointer	
		accounting	real

Karachaganak NGKK raw gas transmission	a thousand.	215	215
H_2S in the mixed gas	%	4,50	4,50
CO_2 in the gas mixture	%	5,80	5,80
H_2S in the product gas at the temperature of 25 am transferred to the plate:			
40 °C	mg/m^3	5	4-8
50 °C		15	17
Jump CO_2	%	38-40	40-45
Commodity gas	a thousand.	199,0	199,0
H_2S is a sour gas	%	57,07	54,89
Circulating amine levels	t/soat	410	410
Saturation of Amin	mol/mol	0,47	0,39

The use of MDEA (N-methyldiethanolamine) instead of DEA (diethanolamine) reduces the consumption of steam for generation, reduces the fuel gas used for burning sour gas and increases the volume of the product gas (the content of SO_2 in the product gas is 2.2 -2.5%).

Table 2

Solubility equilibrium of CO_2 in aqueous solution of MDEA/DEA + EMS absorbents

Absorbent and its composition	Temperature °C	Partial pressure of CO_2, kPa	Amine saturation, mol CO_2 /mol amine
40 % (50 % MDEA / 50 % DEA)	40	5,07	0,43
	70	4,82	0,15
	40	11,97	0,57
	70	11,42	0,24
	40	97,84	0,72
	70	97,84	0,50

40 % (50 % MDEA / 50 % DEA) + 20 % PEGE	40	4,73	0,37
	70	5,30	0,13
	40	10,65	0,48
	70	10,86	0,20
	40	98,90	0,66
	70	98,90	0,41

DEA is one of the industrial enablers of the first MDEA. It has been more than 30 years since foreign countries used the mixture of MDEA/DEA in gas treatment practice, but now this mixed absorbent is gradually being replaced by improved ones, which have better energy efficiency, thermal stability and corrosion activity. In recent years, activated solutions of MDEA have been widely used to purify sour mixtures from the composition of various gases. It is known to use piperazine (PP – $C_4H\ 10N_2$) as an activator, and its alkyl derivatives - polyamines, alkyldiamines - are also widely used [5].

In general, not only H2S gas tank, any foreign substances and compounds are harmful for the human body. Because every person is responsible for his own life and health.

Summary

It is not an exaggeration to say that the above-mentioned sources prove that H_2S gas, while having some useful aspects, can become extremely dangerous when its amount increases, not only for mankind, but also for living nature. H_2S gas can also be used to kill pests in agriculture. But it is dangerous to use this gas without knowing its properties.

Absorbents are used for their neutralization and cleaning.

The use of very new efficient absorbents practically reduces energy costs without any capital investment, improves the quality of the product and reduces toxic emissions into the atmosphere.

MDEA-based activated absorbents can be envisioned to be used in existing gas treatment facilities or in new gas processing facilities.

USED LITERATURE

1. H.N.Halimov S.Sh.Karimov H.O.Obidov. Gaz xomashyosini ishqoriy tozalashning hozirgi zamon usullari// “Science and Education” Scientific Journal / Impact Factor 3,848 (SJIF) February 2023 / Volume 4 Issue 2.

2. Juraev Shoxruh. TABIIY GAZNI TOZALASHDA AMINLI ABSORBENTLARNING TUTGAN O‘RNI// JOURNAL INNOVATIONS IN SOCIAL SCIENCESJOURNAL Volume: 03 Issue: 01 | Jan – 2023.

3. First draft prepared by Dr C.-H. Selene J. Chou, Agency for Toxic Substances and Disease Registry, Atlanta, Georgia, USA. Concise International Chemical Assessment Document 53 HYDROGEN SULFIDE: HUMAN HEALTH ASPECTS// World Health Organization Geneva, 2003.

4. U.S. Department of Labor OSHA FactSheet// DSG 10/2005 www.osha.gov (800) 321-OSHA.

5. T. R. Yuldashev. TABIIY GAZLARNI VODOROD SULFID VA UGLEROD OKSIDLARIDAN TOZALASHDA QO‘LLANILADIGAN ABSORBENTLAR// SANOATDA RAQAMLI TEXNOLOGIYALAR ЦИФРОВЫЕ ТЕХНОЛОГИИ В ПРОМЫШЛЕННОСТИ DIGITAL TECHNOLOGIES IN INDUSTRY. ID: 37094 Volume 1, № 1 September 2023. DOI: https://doi.org/10.5281/zenodo.8377079