TECHNOLOGY FOR PROCESSING CARBON DIOXIDE EXHAUSTED FROM THE MIXTURE OF EXHAUST GAS FLOWS

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https://doi.org/10.5281/zenodo.7225497

Abstract. *Due to the development of industrial technologies in the 20th century, the impact of gases emitted from various fuels burning in factories on the environment is increasing. This has a severe impact on people's health. The article discusses the solutions to these problems.*

Key words: *toxic gases, carbon dioxide, high temperature, fermentation, decomposition, respiration, industrial waste.*

ТЕХНОЛОГИЯ ПЕРЕРАБОТКИ ДИОКСИДА УГЛЕРОДА, ВЫДЕЛЯЕМОГО ИЗ СМЕСИ ПОТОКОВ ВЫХЛОПНЫХ ГАЗОВ

Аннотация. *В связи с развитием промышленных технологий в 20 веке увеличивается воздействие газов, выделяемых при сжигании различных видов топлива на заводах, на окружающую среду. Это серьезно сказывается на здоровье людей. В статье рассматриваются пути решения этих проблем.*

Ключевые слова: *Токсичные газы, углекислый газ, высокая температура, брожение, разложение, дыхание, промышленные отходы.*

INTRODUCTION

At the end of the 20th century, a systematic warming of the environment became noticeable. The reason for this factor is an increase in the concentration of carbon dioxide in the atmosphere. The amount of CO2 emissions in the world in 1995 amounted to more than 22 billion tons/year, including about 115 million tons/year in the Republic of Uzbekistan, and there is a tendency for its increase [1].

RESEARCH MATERIALS AND METHODOLOGY

As you know, carbon dioxide is formed during a wide variety of processes: fermentation, decay, respiration, but the main source of CO2 (more than 15% of the total content in the air) are industrial emissions: during the combustion of solid, liquid and gaseous fuels, as well as during the heat treatment of natural carbonates (limestone, dolomite, magnesite, etc.). Therefore, researchers are faced with the task of reducing CO2 emissions both through its utilization and by eliminating the formation of CO2 during the thermal processing of carbonaceous raw materials.

To successfully solve this problem, it is necessary first to determine the mechanism of CO2 interaction with chemical reagents depending on their composition and process conditions, as well as to analyze the existing methods for cleaning flue gases from carbon dioxide from industrial emissions and its utilization.

Carbon dioxide (CO2) is a colorless gas, 1.5 times heavier than air. Chemically, CO2 is quite inert, thermally stable, dissociates into carbon monoxide and oxygen at high temperatures: % dissociation at 20,000; 29000; 50000C respectively is 2; fifty; 99. dissociation is accelerated by UV rays, high pressure and electric discharge.

RESEARCH RESULTS

Chemically, CO_2 is carbonic anhydride. It reacts with water to form carbonic acid, according to the equation: $H_2O + CO_2 \leftrightarrow H_2CO_3$. Solubility in water (wt %): 0.335 (0°C) and 0.169 (20°C). With strong bases, CO_2, as carbonic anhydride, reacts vigorously, forming carbonates: Na_2CO_3; $CaCO_3$; $MgCO_3$, etc. At high temperatures, CO_2 reacts with strong electropositive metals, giving up all of its oxygen. Thus, a burning magnesium ribbon immersed in CO_2 continues to burn due to oxygen CO_2, and carbon is released, according to the reaction: $CO_2 + 2\ Mg \rightarrow 2\ MgO + C$.

At a red heat temperature, CO_2 with calcium gives carbide and calcium oxide according to the reaction: $5\ Ca + 2\ CO_2 \rightarrow CaC_2 + 4\ CaO$. At high temperatures, it oxidizes iron, silicon and antimony. At 2000C, in the presence of copper oxide, CO_2 reacts with hydrogen to form methane, according to the reaction: $CO_2 + 4\ H_2 \rightarrow CH_4 + 2\ H_2O$. CO_2 reacts with hot coal to form carbon monoxide, according to the reaction: $CO_2 + C \rightarrow 2\ CO$. In the state of equilibrium at atmospheric pressure, the gas mixture contains CO in % 2; 57.7; 94.0; 99.3, respectively, at a temperature of 4500; 7000; 8000 and 10000C. At a red heat temperature, CO_2 with ammonia gives urea, according to the reaction: $CO_2 + 2\ NH_3 \rightarrow CO(NH_2)_2 + H_2O$. The main process of CO_2 extraction from flue gases is its adsorption and desorption. To clean and utilize CO_2, flue gases are passed through towers, in which a solution of potash (K_2CO_3) flows over pieces of coke [2]. The latter absorbs CO_2 with the formation of bicarbonate and releases it again when heated, according to the reactions: $K_2CO_3 + CO_2 + H_2O \rightarrow 2KHCO_3$ heating $2KHCO_3 \rightarrow K_2CO_3 + CO_2 + H_2O$. An effective absorbent is monoethanolamine. This weak base absorbs CO_2 from the air well. Optimum absorption at 4000C, desorption at 1100 - 1200C. In addition, other methods for separating CO_2 are also proposed, in particular, a membrane adsorption method using hollow hydrophobic fibers of polymeric materials (polytetrate, fluoroethylene, polyethylene, polypropylene, etc.) and various types of absorption solutions, as the latter, aqueous solutions of sodium salts are used, monoethanolamine, etc.

CONCLUSION

Theoretical and experimental studies of the process of purification of flue gases of industrial installations from CO and CO_2 are presented in the literature, with the production of nanometer-sized solid carbon particles with an amorphous soot structure as the final product. This is achieved by the destruction of CO and CO_2 under the action of an electric discharge.

Modern advances in science and technology currently allow some technological processes to be implemented using the energy of alternative and / or renewable energy sources and energy carriers. Direct reduction of carbon dioxide with hydrogen or methane, or other reducing agents, can only be carried out within the framework of laboratory studies, since the technology is very capital and energy intensive. For example, in catalytic reduction, passing a mixture of carbon dioxide and hydrogen through a stationary catalyst bed, obtained by electrolysis of water using solar energy, makes it possible to obtain gaseous carbon with a specific structural lattice. And the use of a product of biochemical decomposition of secondary organic and agricultural materials as a biomethane reducer also makes it possible to obtain elemental carbon. It should be noted that for the implementation of such chemical reactions, it is considered expedient to switch to the fluidized state of the catalysts, against the stationary state, in order to avoid covering the catalyst surface with the product of the chemical conversion of carbon dioxide. Unlike the use of other reducing agents, the reaction with biomethane does not require preliminary preparation of biomethane, since the content of carbon oxides in the composition of biogas practically does not affect the technological process. A laboratory sample of elemental carbon was obtained under laboratory conditions by reduction of carbon dioxide. The optimal physical and chemical parameters of carbon dioxide reduction were established with the identification of special requirements for the composition of carbon dioxide.

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