



National Iranian Oil Refining and Distribution Company
(NIORDC)



Journal of Farayandno

Review Paper

An Overview of Emission Sources, Separation Methods and Valuable Crops Producing from CO₂

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Received: 7 Nov 2022 Accepted: 17 Jan 2023

1. ABSTRACT

The increase in CO₂ emissions is the main cause of global warming and causes adverse environmental challenges. Based on this, finding ways to convert CO₂ into useful products can help reduce the harmful environmental effects of this substance on the one hand, and increase the economic efficiency of the process to produce valuable products on the other hand. Thus, in this article, the sources of CO₂ emissions were investigated first, and then the methods of separating this gas were described. Also, the use cases of this substance in various industries were discussed. The results obtained from various studies showed that membrane contactors are one of the effective technologies in CO₂ absorption. Also, the product that is currently produced in large quantities from CO₂ is urea. The obtained results indicated the production of 157,000,000 tons of urea in the world in 2010. Furthermore, electrochemical and photocatalytic methods were recognized as suitable methods for producing products from CO₂. Meanwhile, the primary challenges in the way of applying CO₂ recovery technologies in Iran include economic limitations and structural and institutional problems. By overcoming these challenges and applying CO₂ recovery technologies, Iran can significantly reduce its environmental greenhouse gas emissions and gain significant economic benefits.

Keywords: CO₂, the Environment, Valuable Chemicals, Membrane Contactors.

2. INTRODUCTION

Greenhouse gases are one of the most important and fundamental environmental pollutants that threaten human life in the form of a serious crisis. Greenhouse gas is a gas that exists in the atmosphere of a planet and absorbs and emits radiation in the infrared range. This process is the main cause of the greenhouse effect. Greenhouse gases in the earth's atmosphere that exist naturally include water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), dinitrogen monoxide (N₂O) and ozone (O₃). But human activities have increased the amount of many of these gases. Meanwhile, the most important greenhouse gas whose release in the atmosphere is widely related to human activities is CO₂. The increase in CO₂ emissions is the main cause of global warming and causes adverse environmental challenges such as climate change and acidification of seas and oceans [1-3]. Based on this, finding ways to convert CO₂ into useful products can help to reduce the harmful environmental effects of this substance on the one hand, and on the other hand, develop the economic efficiency of the process to produce products with high economic value. In other words, one of the basic ways to reduce CO₂ emissions is to separate and purify this gas and return it to the desired product production processes based on market demand. Thus, in this article, the emission sources and methods of CO₂ separation and the role of membrane contactors in its separation are stated, and the valuable chemical substances that can be produced from this gas are also discussed. It should be noted that the present research is one of the most recent review works in which emission sources, separation methods and valuable products that can be produced from CO₂ are simultaneously discussed.

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Please Cite This Article Using:

Amirabedi, P., pourkhanali, K., "An Overview of Emission Sources, Separation Methods and Valuable Crops Producing from CO₂", Journal of Farayandno – Vol. 17 – No. 80, pp. 39-59, In Persian, (2023).



6. CONCLUSION

In this article, the sources of CO₂ production were investigated first, and then the use of this substance in various industries was stated. Studies have shown that membrane contactors have a high potential for CO₂ separation. An important point in this is that in choosing the right method to convert CO₂ into a product, the type of product, the biocompatibility of the method, the efficiency of the process and the operating cost are among the most important things that should be considered before be considered from product fabrication. Based on this, electrochemical and photocatalytic methods were recognized as suitable methods for producing products from CO₂.

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