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**Launch of the Demonstration Project of CO2 Recovery Process
-JOGMEC Technical Solutions Project-**

Japan Oil, Gas and Metals National Corporation (JOGMEC) announced the commencement of the demonstration project of CO2 recovery process using DDR-Type Zeolite membranes. This is a Phase-3 Technology Development Project of JOGMEC Technical Solutions Project program.

JOGMEC has been engaged in Technical Solutions Project program since 2013. In this program, JOGMEC has been working together with Japanese companies to provide solutions for technical issues (needs) faced by operators in oil producing countries. Through such collaboration activities, JOGMEC has been strengthening the relationship with oil-producing countries etc. and contributing to the projects of oil & gas business by Japanese companies.

In 2018, JOGMEC sponsored a needs & seeds survey with a specific focus on membrane CO2 separation of high CO2 associated gas from CO2-EOR (Note1). JGC Corporation (JGC) proposed the application of DDR-type zeolite (Note2) membranes and conducted a technical investigation and review of the technology. As a result of the investigation, the effectiveness of the technology was confirmed to be promising, hence a field demonstration project has been set up with partners.

The demonstration test will verify the performance of the Process using large-size elements (180 mm diameter × 1,000 mm length) of the DDR-type zeolite membrane, and aims to ensure its effectiveness for various use cases described below. The Process has been jointly developed by NGK INSULATORS, LTD. (NGK) and JGC since 2008. The DDR-type zeolite membranes will be manufactured by NGK using their advanced membrane production technology, and its outstanding CO2 selectivity and high pressure resistance have been verified through tests carried out at research facilities.

Overview of the Demonstration Project

Name	Field demonstration test of DDR-type zeolite membrane technology
Demonstrator	Joint project by JOGMEC and JGC
Site	Texas, USA.
Targeted gas and the field	Associated gas produced from CO2-EOR oil production. CO2-EOR has been employed in the subject field as a CCUS (Note3) project. DDR-type membrane process will be used to purify CO2 content of the associated gas for CO2

	recycling.
Test brief	Optimization and performance test of the CO ₂ recovery facility using DDR-type zeolite membranes (associated gas processing capacity: 3 million cubic feet per day)
Schedule	Designing and construction of the test facility began in February 2019. Demonstration tests will be carried out over approximately one year after the test facility completion

JOGMEC anticipates the Process to be applied to CO₂ recovery from associated gas produced in CO₂-EOR operations. Additional crude oil production as well as operation cost reduction is expected from the successful deployment of the Process. Furthermore, JOGMEC sees the possibility of the Process to be applied to CO₂ removal for the development of high CO₂ containing gas resources.

CO₂ recovery from associated gas during CO₂-EOR oil production

In CO₂-EOR, which is one example of CCUS, CO₂ is separated and recovered from associated gas during oil production and recycled. Polymer membranes are generally used for CO₂ separation. However, significant deterioration of polymer membranes often occurs when the associated gas contains high concentration of CO₂, which leads to frequent replacement of the membranes. On the other hand, the DDR-type zeolite membrane is highly durable and maintains high separation performance even under high CO₂ concentration conditions. Expected benefits include additional crude production by purified recycle CO₂ and operation cost reduction, and JOGMEC believes it will contribute to the expansion of CO₂-EOR business.

CO₂ removal for high CO₂ containing gas resources

As CO₂ concentration in natural gas increases, the required amount of solvent for CO₂ removal increases, leading to an increase in the energy requirement for solvent regeneration. Therefore, conventional chemical solvent methods may not be economically applicable to high CO₂ gas resource developments. A combination of DDR membrane process for the bulk removal of CO₂ with conventional chemical absorption processes can avoid such problem and is expected to achieve a cost competitive CO₂ removal system, which is essential to high CO₂ gas resource developments.

Contribution to oil and gas resource developments

CO₂-EOR has been introduced in USA since 1970s, and is expected to expand to regions such as South East Asia and Middle East, to enhance crude production from mature oil fields.

In addition, there are many natural gas fields with high CO₂ content that have not been fully developed yet in South East Asia, especially in Malaysia and Indonesia.

JOGMEC commits to contribute to oil and gas resource developments through the deployment of DDR membrane CO₂ removal process.

(Note 1) CO₂-EOR: CO₂ Enhanced Oil Recovery

Technology in which CO₂ is injected into the oil reservoir to improve the fluidity of the crude oil and enhance its production. A part of the injected CO₂ is stored underground during this process, therefore considered as one of the realistic CCUS methods.

(Note 2) Zeolite

Zeolite is a microporous crystalline aluminosilicate. A variety of zeolites have been synthesized artificially and used industrially as a catalyst, adsorbent, etc. DDR is one of zeolite's framework structures.

(Note 3) CCUS (Carbon Capture, Utilization and Storage)

Initiatives to create economic value through the recovery and storage of CO₂, as well as its effective use. CCUS has been attracting attention from around the world recently, as measures against global warming.