Enhancement and commercialization of CO_2 capture and storage

Development of CO_2 Capture and Storage Technology

Features

- Liquid chemical absorbent: The developed liquid absorbent achieved the regenerated energy of 2.0 GJ/t-CO_2, and regenerates CO_2 from the liquid absorbent at a temperature of 100°C or lower.
- Polymeric membrane: The developed molecular gate membrane achieved a large CO_2/H_2 separation factor at a high CO_2 permeance.
- Solid sorbent: The solid sorbent was developed based on the RITE solvent. It exhibits a good desorption performance at a low temperature.

Overview (Technical principles, actions, etc.)

1. Development of the liquid chemical absorbent

In the five-year project for the Steelmaking Process by Innovative Technology for Cool Earth 50 (COURSE50), RITE developed the liquid chemical adsorbent in cooperation with Nippon Steel & Sumitomo Metal Corporation.

As a result, a liquid chemical adsorbent that achieves the target performance (regenerated energy: 2.0 GJ/t-CO_2) and allows CO_2 regeneration at a temperature 100°C or less was developed (conventionally, the temperature had to be 120°C). The adsorbent was adopted by private companies.

2. Development of the CO_2 filtration membrane

In the Molecular Gate Membrane Module Technology Research Association, RITE is developing a molecular gate membrane, membrane module, and membrane separation system as a contractor of the Ministry of Economy, Trade and Industry (Figure 1). To ensure that the cost of CO_2 recovery from IGCC and other pressurized gases is 1,500 yen/t-CO_2 or less, we improved the membrane materials and developed a membrane that meets the project's target performance.

3. Development of solid sorbent

As part of a project outsourced by the Ministry of Economy, Trade and Industry, we are working on the development of a high-performance solid sorbent suitable for separating/recovering CO_2 from coal fired power plants (target regenerated energy: 1.5 GJ/t-CO_2). By revealing the relationship between the chemical structure and performance of amine supported by a porous support, we have successfully developed a proprietary solid sorbent with a good desorption performance and high CO_2 recovery capacity (Figure 2).

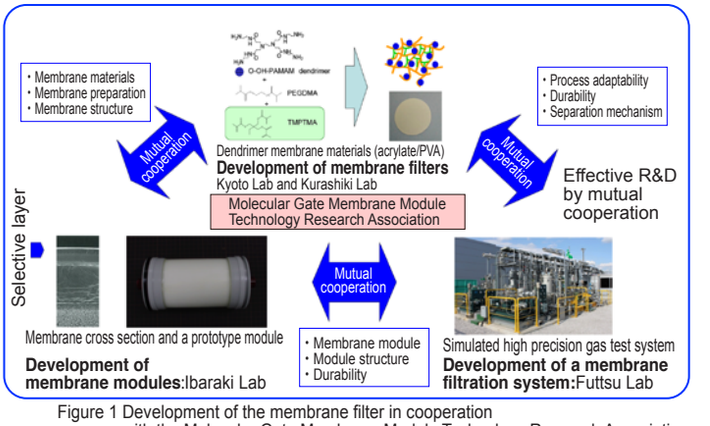

Figure 1 Development of the membrane filter in cooperation with the Molecular Gate Membrane Module Technology Research Association

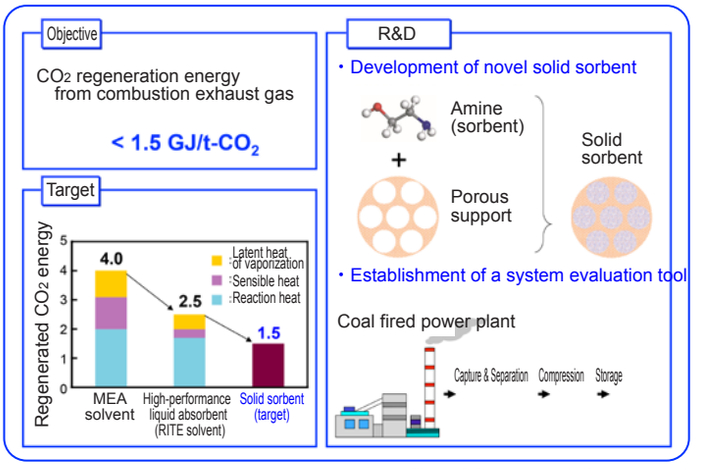

Figure 2 Development of solid sorbent

Introductory Track Record

- Examples of application: RITE and Nippon Steel & Sumitomo Metal Corporation jointly developed high-performance chemical absorption solution. Nippon Steel & Sumikin Engineering employed the chemical absorption solution for the first commercial energy efficient carbon dioxide recovery system, which started operation in November 2014.

Effects

◎CCS (CO_2 Capture and Storage) refers to the technology for separating and recovering CO_2, a greenhouse gas generated by burning fossil fuels, from power plants, iron works, factories and other such sources, and store/isolate the recovered CO_2 underground or under the seabed. It is estimated that about half the CCS cost is spent in CO_2 recovery from these sources, and it is essential to reduce the CO_2 separation/recovery cost to promote commercialization of CCS.

The Chemical Research Group is working on the development of technologies for reducing the CO_2 separation/recovery cost and achieved world-class research and development results including chemical absorbent, membrane filtration, and adsorption methods.

Research Institute of Innovative Technology for the Earth
Research and Coordination Group
9-2, Kizugawadai, Kizugawa-Shi, Kyoto, 619-0292 Japan
● TEL / +81-774-75-2301 ● FAX / +81-774-75-2314 ● E-Mail / pub_rite@rite.or.jp ● http://www.rite.or.jp