CO_2 separation properties under pressurized condition @ Austin, TX

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CO_2 separation by membranes has been investigated in this division. The plausible separation target can be the mass emission sources, such as thermal power stations and steal works, to mitigate CO_2 emission to atmosphere. In membrane separation, pressure difference between the feed and the permeate sides, drives the separation, thus membrane separation would be suitable technology at a site, where the CO_2-containing exhaust gas is pressurized. One candidate is an IGCC (integrated gasification combined cycle) plant. After the water-gas shift reaction, the syngas consists of H_2 (54 %) and CO_2 (36 %) with 2.4 MPa in total pressure, in which partial CO_2 pressure, $p(CO_2)$, is 1.0 MPa.

The presenter has been working on CO_2 separation over H_2 with poly(amidoamine) (PAMAM) containing polymeric membranes. The PAMAM membranes exhibit excellent CO_2 separation properties at lower CO_2 partial pressure. However, the properties under pressure over 1.0 MPa have not been studied due to the legislative issue in Japan. Prof. Benny D. Freeman, who is one of the most leading scientists in membrane science and the I^{2}CNER professor of this division, helped the gas separation test under high pressure at his laboratory in the University of Texas at Austin. In this presentation, the result of gas permeation experiment will be presented.

During the stay, the 12th international greenhouse gas control technology conference was held at Austin, which is the biggest international meeting relating to the CO_2 issue. The results of CO_2 separation in this institute were presented at the meeting [1]. In addition, as an alternative use, the PAMAM membranes can be applied for CO_2-free H_2 production at a H_2 station with the steam reforming process of hydrocarbons. And CO_2 capture at H_2 station plus small scale CCS (CO_2 Capture & Storage) was also introduced as a result of interdisciplinary research between the CO_2 storage, the energy analysis and the CO_2 capture & utilization divisions [2].

[1] Taniguchi, I., Fujikawa, S., CO_2 separation with nano-thick polymeric membrane for pre-combustion, *Energy Procedia*, **63**, 235-242, 2014.

[2] Kimura, S., Honda, K., Kitamura, K., Taniguchi, I., Shitashima, K., Tsuji, T., Fujikawa, S., Preliminary Feasibility Study for On-Site Hydrogen Station with Distributed CO_2 Capture and Storage System, *Energy Procedia*, **63**, 4575-4584, 2014.