Development of Global CO_2 Recycling Technology Towards "Beyond-Zero" Emission

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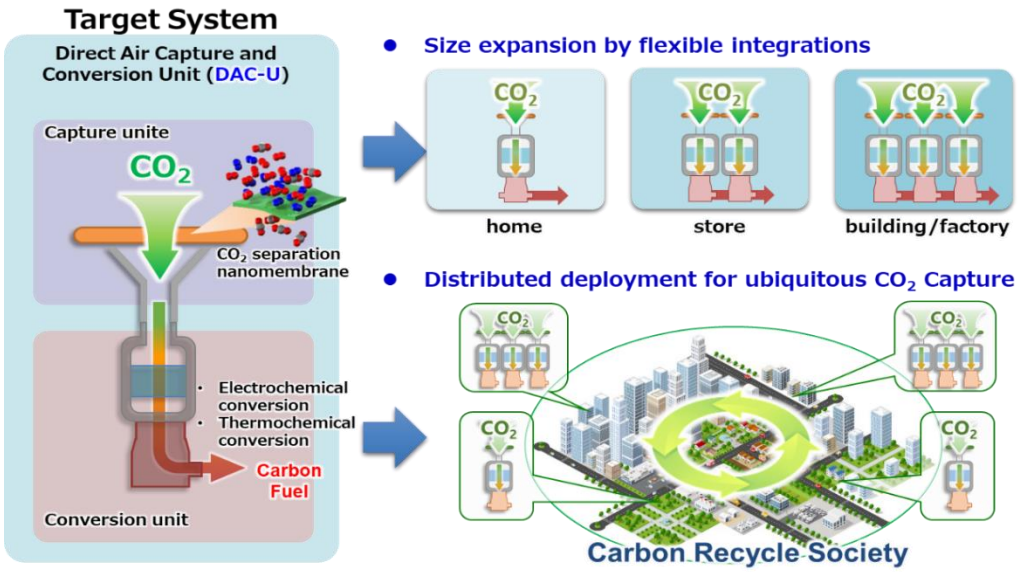
Summary

This project aims to develop a distributed CO_2 recycling system that captures CO_2 from the atmosphere by membrane and converts it into carbon fuel.
Based on our innovative separation nanomembranes with world-leading CO_2 permeability and nanomembrane technology, the project will develop a CO_2 capture unit consisting of CO_2 separation nanomembranes with high CO_2 selectivity, and a highly efficient CO_2 conversion unit that converts the captured CO_2 into carbon fuel. These two units will be integrated into one system, named the "Direct Air Capture and Utilization" (DAC-U) system which can deliver a continuous process from CO_2 capture from the atmosphere through to carbon fuel conversion. This system provides the flexibility to adjust the performance of the system to meet requirements based on location, cost, application, and other local conditions. This innovative DAC-U system will enable the ubiquitous capture of CO_2 from the atmosphere and the recycling of CO_2 as a carbon fuel. Our goal is not only to solve the problem of climate change, but also to contribute to the realization of a carbon-recycling society based on Local Production Local Consumption.



Targets by 2030

FY2022: Select basic materials for separation membrane with high CO_2 selectivity. Proof chemical conversion process of CO, CH_4, and C_2H_4 from CO_2 mixture gases.
FY2024: Development of CO_2 capture nanomembranes with CO_2/N_2 and CO_2/O_2 of ca. 30 and 10, respectively. Conversion of CO, CH_4, C_2H_4 from CO_2 mixture gases with the conversion efficiency of 8 to 30% by electrochemical way and continuous production of CO and CH_4(yield:90%) by thermochemical process.
FY2029: Development of small DAC-U system integrated with CO_2 capture unit (concentration: over 1000 times, capture amount: 2 kg/day-CO_2) and conversion unit to produce C1/C2compound with the yield of more than 80%.

Implementation

Kyushu University, Kumamoto University, Hokkaido University