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Activities of the Core

Nov. 5, 2020	The 89th Hiroshima University Biomass Evening Seminar (co-organization).
Nov. 17, 2020	Society for the Hydrogen energy and Next-generation energy Utilization ～ Seminar 2020 Vol.1 (co-organization).
Nov. 20, 2020	The 51st HU-ACE Steering Committee Meeting.

We co-organized the International Conference JCREN2020.

We successfully co-organized JCREN2020, which we do every year, on Oct. 28-29, 2020 online although we were not sure if we could really hold it due to COVID-19. It was supposed to be held in Khon Kaen, Thailand, but we had to decide that we could not physically gather this year. Despite this difficulty, thanks to the dedication from Khon Kaen University staffs, we had as many participants as usual year, and got online access from various countries. We had an exciting time in the photo session at the end of the conference with joining of many participants. Next year, this conference will be held online, organized mainly by Japanese organizing committee.

Figure Part of the photos of participants taken in the photo session

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Research Topics

No. 22

Study on the Realization for "Carbon-Recycle Complex" along Seto-Inland-Sea

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Research fields: Energy policy, Social Science

Keywords: Hydrogen, Carbon-Recycling, TEA(Techno-Economic Assessment)

Abstract

Outline

To achieve the target set by Paris Agreement and Japanese new cabinet, this study will draw up grand design on the evolution from petrochemical complex into "Carbon-Recycle Complex", through the feasibility study on producing chemicals in Seto-Inland-Sea Complex(SISC) using methanol and DME (dimethylether) from captured carbon and CO_2-Free Hydrogen.

Background

Seto-Inland-Sea has abundant CO_2-emission sites along its coast, such as thermal power plants, ironworks, cement factories. Particularly, in Osaki-Kamijima town (which belongs to Hiroshima Prefecture), OCG (Osaki CoolGen Co.) has been demonstrating CO_2 capture as a national project from 2019 (its designing started 2016).

H2 for Carbon Recycling

Hydrogen as a material to synthesize carbon-recycle-chemicals should be CO_2-free, unlike most of commercialized H_2. Under the current situation, we have only one method to produce CO_2-free H2, the electrolysis of water using power derived from renewables (Renewable H_2). High cost of H_2 is mostly attributed to low operating rate of electrolyzer, responding to maximum output of renewables. Instead, leveling surplus power (after selling) by batteries, we can reduce capacity & cost of electrolyzer. This method is expected to bring low cost of H_2(about 20 JPY/Nm^3).

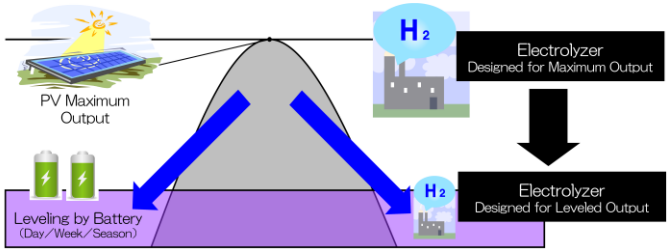

Fig. 1 Production of less expensive, CO2-free hydrogen (concept)

Synthesizing Carbon Recycling Chemicals

Supposing in Osaki-Kamijima town, synthesizing methanol and DME from captured carbon and renewable H_2. Both of them can be transported by land (tank truck) and ocean (tank vessel) to neighboring complexes such as Iwakuni-Otake, Mizushima, Shunan, and Ube-Onoda to use as starting materials for most of chemicals.

These complexes are considered to have dormant facilities due to dwindling competitiveness against newly-constructed competitors in overseas, and we can utilize such facilities to produce derivatives from methanol and DME as "Carbon Recycling Chemicals". I will select and estimate the profitability for "strategic(promising) chemicals", considering high demand in the future and possibility of disruption on supply chain by overseas trade, disasters, and other accidents like COVID-19.

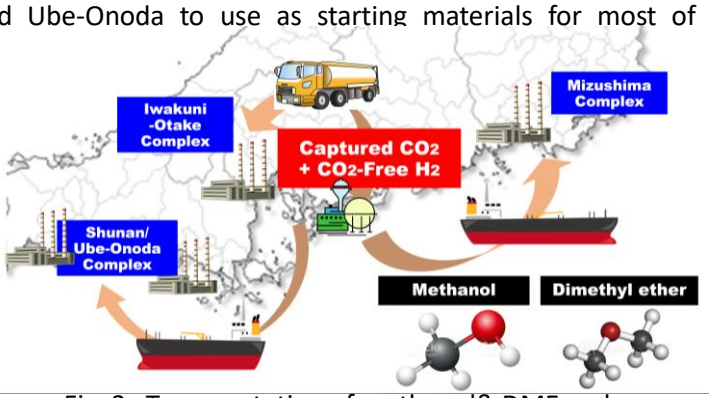

Fig. 2 Transportation of methanol& DME and production of chemicals in complexes (concept)

Acknowledgments

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