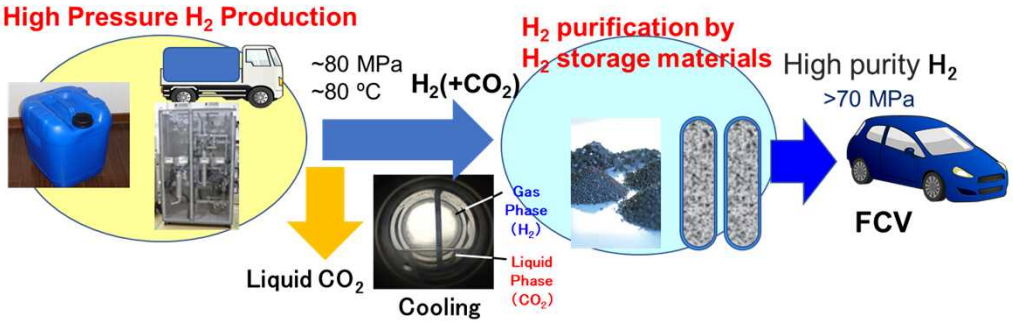
Project Title : International joint research for supply technology of high-pressure and purity of hydrogen by chemical compressor using formic acid. （2021～2024）

Entrusted Party : National Institute of Advanced Industrial Science and Technology

Outline of the Project

For the realization of a hydrogen society, the use of high-pressure hydrogen (35-70 MPa) for refilling into FCVs including the hydrogen compression still has technical, efficiency and cost issues.
In the present work, a high-pressure hydrogen generation system including highly efficient catalysts for dehydrogenation of formic acid will be developed based on the characteristic of formic acid as a liquid organic hydrogen career. We will build up novel hydrogen compression technologies that enable to provide 70 MPa class of hydrogen through the dehydrogenation of formic acid as a chemical compressor without using a high-cost mechanical compressor. Furthermore, we will develop hydrogen storage materials, which can purify hydrogen under high-pressure conditions and supply it to FCVs depending on the demand.
We aim to establish the unprecedented and innovative high-pressure and high-purity hydrogen supply technology, which will greatly reduce the initial investment and maintenance costs of hydrogen refueling station.



Significance of International R&D

We will efficiently accelerate research and development under the international collaborations.

- Development of catalyst for high pressure H_2 production: King Abdullah University of Science and Technology
- Development of CO_2-resistant hydrogen storage materials to build up hydrogen purification, storage and supply technologies: Queen Mary University of London, Korea Advanced Institute of Science and Technology, Delft University of Technology
- Development of material synthesis method under high-pressure hydrogen: East-Paris Institute of Chemistry and Materials Science

Project Scheme

NEDO → Funding → AIST

Joint R&D contract

- Delft University of Technology (Netherlands)
- East-Paris Institute of Chemistry and Materials Science (France)
- Korea Advanced Institute of Science and Technology (Korea)
- King Abdullah University of Science and Technology (Saudi Arabia)
- Queen Mary University of London (UK)
- University of Oslo (Norway)

Expected Outcomes

Assuming that our technology will be widespread and the number of FCVs will be 800,000 in 2030 and 8,000,000 in 2050, the estimated annual CO_2 reduction in Japan is as follows.

- 2030: 178 000 ton-CO_2/y
- 2050: 1780 000 ton-CO_2/y

Further CO_2 reduction can be expected by expanding our technology for trucks and forklifts, etc. and reducing the construction costs of hydrogen filling stations by simplifying the hydrogen transportation, compression and purification system.