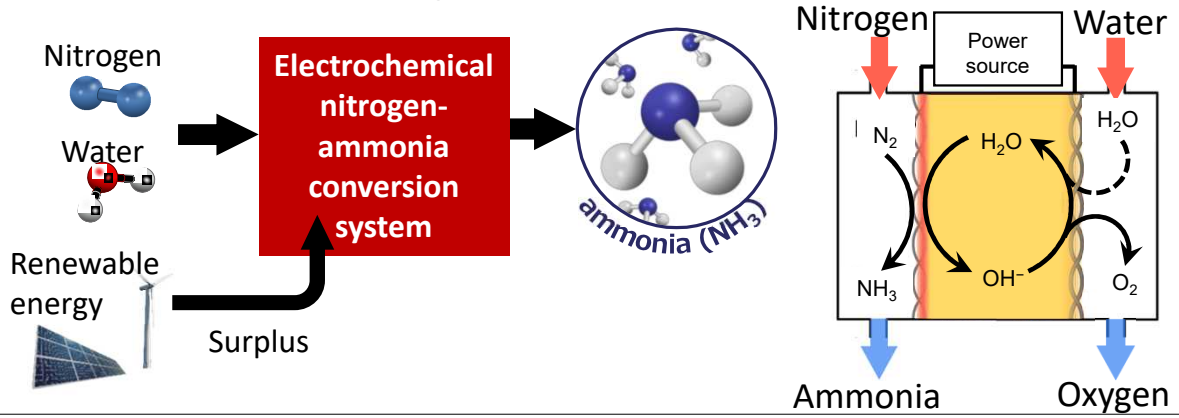
Project Title: International Collaborative Research for Electrochemical Ammonia Synthesis Under Ambient Conditions (2022–2025)

Entrusted Party: Osaka University

Outline of the Project

Ammonia is a raw material for a wide variety of fertilizers and chemicals and is recently attracting attention as an energy carrier. Currently, ammonia is synthesized at high temperatures and high pressure by the Haber-Bosch process, which consumes a great deal of energy and generates large amounts of CO_2. This project aims to realize the electrochemical synthesis of ammonia from nitrogen and water at room temperature via international joint research with Imperial College London (ICL) in the UK. Based on unique electrolyte design and operando reaction analysis of Osaka University (OU), a highly efficient conversion reaction of nitrogen-ammonia will be realized.



Project Scheme

NEDO
(New Energy and Industrial Technology Development Organization)

Funding

Osaka University

Joint R&D contract

Imperial College London (ICL)
・UK

Significance of International R&D

ICL has pioneered the design of electrocatalysts for nitrogen-ammonia conversion reactions. ICL has already succeeded in electrochemical ammonia synthesis from nitrogen and alcohol, but electrolyte decomposition on the electrocatalysts has hampered further improvement in conversion efficiency. This issue will be addressed by OU's original electrolyte design technology to achieve a highly efficient nitrogen-ammonia conversion using water as a hydrogen source.

Expected Outcomes

A highly efficient nitrogen-ammonia conversion device will not only decrease ammonia production costs and energy usage but also enable on-site ammonia production to reduce the cost and CO_2 emissions of its transport and storage. This technology is expected to reduce CO_2 emissions by 360 million tons/year, reduce costs by 3.04 billion yen/year, and save energy equivalent to 32,500 kL/year of crude oil in 2040.