

Experiments on fuel ammonia

We are conducting experiments to safely handle ammonia, a hazardous substance, both in liquid and gas form.

Circumstance

We are focusing on ammonia and building infrastructure and experimental systems to achieve carbon neutrality.

- While ammonia holds great promise for achieving carbon neutrality by 2050, it must be handled with care due to its distinctive pungent odor and toxicity.
- KRI has dedicated facilities and uses its cultivated technology to safely conduct various experiments involving ammonia.



Constant temperature bath



Ammonia detoxification equipment

An example of an ammonia experiment

We can safely conduct a variety of experiments using infrastructure dedicated to ammonia. Testing is possible under a variety of conditions, from low to high temperatures, for both liquid and gas.

Experiment 1: Liquid ammonia injection experiment using a simulated fuel tank

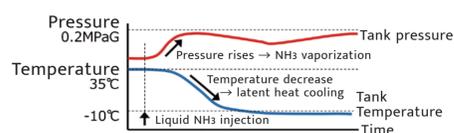
- Liquid ammonia at -40°C was poured into a room-temperature container, and the temperature and pressure inside the container were measured.



Liquid ammonia injection test equipment



Liquid level
Liquid ammonia before addition
 -40°C 40cc



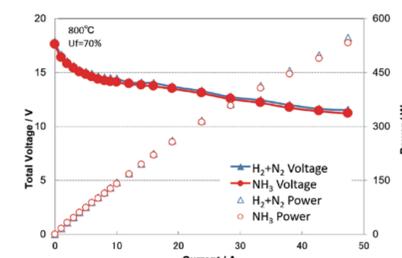
The container was cooled by the latent heat of vaporization of liquid NH_3

Experiment 2: Direct ammonia fuel cell power generation test

- Ammonia gas is supplied to the SOFC stack to obtain power generation characteristics



SOFC evaluation equipment

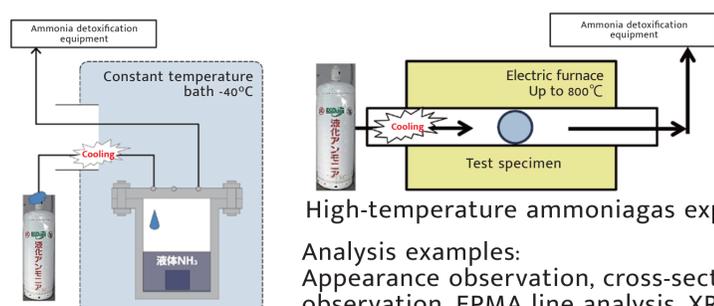


Power generation characteristics data

The power generation characteristics were equivalent to those of ammonia decomposition simulation.

Experiment 3: Ammonia immersion/exposure test for evaluating material degradation

- Immerse the test specimen in liquid ammonia at -40°C .
- Heat ammonia gas, expose the test specimen to it for a set period of time, then remove and analyze it.

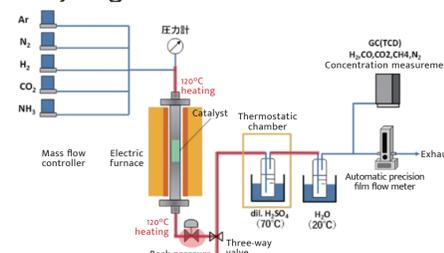


High-temperature ammoniagas exposure test

Analysis examples:
Appearance observation, cross-sectional SEM observation, EPMA line analysis, XRD structure analysis, etc.

Experiment 4: Ammonia decomposition catalytic reaction test

- Ammonia gas was passed through a catalyst whose temperature was controlled in an electric furnace.
- The H_2 and Na concentrations and flow rate of the decomposition gas were measured.
- Ammonia methanation tests using ammonia as a hydrogen source were also conducted.



Ammonia Reaction Test Equipment