PRESS RELEASE

Results of Joint Research into Hydrogen Energy Solutions Supported by the Toyota Mobility Foundation were Published in the *International Journal of Hydrogen Energy*

Tokyo, Japan (8 February 2023) - A review article by a team of researchers supported by the Toyota Mobility Foundation (TMF) has been published in the *International Journal of Hydrogen Energy*, a world-renowned scientific journal issued by the Dutch academic publisher Elsevier.

Title: Influence of renewable energy power fluctuations on water electrolysis for green hydrogen production

Authors: Hirokazu Kojima (National Institute of Advanced Industrial Science and Technology), Kensaku Nagasawa (Yokohama National University), Naoto Todoroki (Tohoku University), Yoshikazu Ito (University of Tsukuba), Toshiaki Matsui (Kyoto University), Ryo Nakajima (techno2050 NAKAJIMA PE Office TMF Advisor)

Website (English): https://www.sciencedirect.com/science/article/pii/S0360319922052028

To realize a decarbonized society, the introduction of a large amount of renewable energy is essential. However, renewable energy is characterized by the fact that its ability to generate power fluctuates depending on the weather and the time of day. There is hope that hydrogen can serve as a regulating force to adjust such fluctuations in power, and water electrolysis is a key technology for converting that energy.

This review article investigated a wide range of issues for each major water electrolysis method, such as restrictions on using renewable energy as a power source for water electrolysis, the durability of water electrolyzers, and catalyst degradation. It then described the performance requirements for water electrolysis systems and materials that can adapt to renewable energy fluctuations and the issues that need to be discussed going forward.

TMF has positioned environmental and energy issues as important themes for a sustainable mobility society, and in 2017, established the “Research Program to Support Innovative Hydrogen Energy Solutions” that targets carbon-free hydrogen (green hydrogen) cost reductions across the entire hydrogen supply chain of “producing,” “transporting,” and “using.” In this program, 29 promising research themes have been selected and provided grants through open calls over three years. Additionally, regular evaluations and advice by an evaluation committee of experts in hydrogen and energy systems and opportunities for exchanges and mutual study among selected researchers have been provided.

In October 2020, the Japanese government made a “Carbon Neutrality by 2050” declaration. For realizing a decarbonized society, in addition to supporting basic research by individual researchers, in April 2021, TMF started a new joint research program to be conducted by teams of researchers. In this joint research program, two working groups (WG) were formed to focus on two important themes for realizing a decarbonized society, “Hydrogen Society & Energy Systems” and “Water Electrolysis.” Five researchers for each WG were selected under the “Research Program to Support Innovative Hydrogen Energy Solutions.”

Based on information obtained by conducting literature reviews on the impact of renewable energy power fluctuations on water electrolysis systems, the research team has started research using a practical water electrolysis device installed with the cooperation of the National Institute of Advanced Industrial Science and Technology. To date, few published studies have investigated the behavior, performance degradation, and effects on durability caused by fluctuations in renewable energy power output using actual equipment. The results of this study are expected to contribute to solving problems related to improving performance and reducing the costs of water electrolysis.

Device specifications: Solid polymer (PEM) type water electrolysis hydrogen generator

Hydrogen production capacity: 10Nm3/h

Location: National Institute of Advanced Industrial Science and Technology Fukushima Renewable Energy Institute

Water electrolysis hydrogen generator

About the Toyota Mobility Foundation

The Toyota Mobility Foundation (TMF) was established in August 2014 by the Toyota Motor Corporation (TMC) to support the development of a more mobile society in which everyone can move freely. The Foundation underscores TMC's on-going commitment to continuous improvement and respect for people. It utilizes Toyota's expertise and technologies to support strong mobility systems while eliminating disparities in mobility. TMF works in partnership with universities, governments, non-profits, research institutions and other organizations, creating programs are aligned with the UN Sustainable Development Goals (SDGs) to address mobility issues around the world.

SDG Targets related to the activity featured in this article:

Contact:
Toyota Mobility Foundation
info@toyota-mf.org