News Release

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For Immediate Release

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(Code No.: 4078 TSE Prime)

Announcing the Development of an Environmentally-Friendly Catalyst (Proton-Exchange Membrane (*PEM) Water Electrolysis Anode Catalyst Ir/ENETIA®)

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Helping to Popularize of PEM Water Electrolysis Devices to Create a Hydrogen-Based Society

Sakai Chemical Industry is pleased to announce the development of Ir/ENETIA®, a new catalyst that will contribute to water splitting to produce hydrogen, an anticipated source of next-generation energy. We will remain committed to solving social issues through the power of chemistry.

An overview is as follows.

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1. Overview

Sakai Chemical Industry focuses on research and development in the three areas of (1) life sciences and healthcare, (2) environment and energy, and (3) electronic materials and information communication, with "solving social issues through manufacturing" as its materiality in each area. For each of these fields, we have developed a cosmetic materials business that provides sunscreen ingredients for (1), a catalyst business that deals with deNOx catalysts to help remove nitrogen oxide at waste incineration sites for (2), and an electronic materials business for multilayer ceramic capacitors for (3) as existing businesses, which are deeply involved in every life.

Now that achieving a carbon-neutral society by 2050 has become increasingly sought after, Sakai Chemical Industry has focused on developing materials related to the highly anticipated potential of hydrogen to contribute to the fields of environment and energy, and has consequently developed Ir/ENETIA®, a new PEM water electrolysis anode catalyst.

(*PEM: Proton-Exchange Membrane)

■Key Takeaways of This Product Development

- A PEM water electrolysis anode catalyst that combines independently developed substoichiometric titanium oxide ENETIA® (TiOx) with iridium (Ir).
- Catalytic activity equivalent to or greater than conventional iridium catalysts and significant durability improvements achieved.
- Enables reduction in the use of iridium, a rare and expensive precious metal.

2. Background

In recent years, hydrogen is anticipated as a next-generation energy source, and water electrolysis technology that splits water into hydrogen and oxygen has advanced. Hydrogen produced through electrolysis using renewable energy, known as “green hydrogen”, can be manufactured without emitting CO_2, prompting extensive research and development toward achieving carbon neutrality. Among water electrolysis technologies, PEM water electrolysis, known for its high electrolysis efficiency, responsiveness to power fluctuations, and superior durability, has been garnering attention as an environmentally friendly technology utilizing renewable energy.

However, as PEM water electrolysis uses iridium, an extremely rare and expensive precious metal, for the catalyst in the electrode, reducing iridium usage has become an urgent challenge for the widespread use of this technology.

3. Technical Details and Results

Since commencing industrial production of anatase in 1935 for the first time in Japan, Sakai Chemical Industry has combined its core technology and expertise in titanium dioxide cultivated over its long history to develop substoichiometric titanium oxide TiOx (ENETIA®) using unique technology. By combining ENETIA® and iridium oxide, we have developed Ir/ENETIA®, which can be used as an anode catalyst for water electrolysis electrodes (Figures 1 and 2).

This newly developed product achieves catalytic activity equal to or greater than conventional iridium oxide catalysts (IrOx) with only about 1/10th the amount of iridium and is characterized by its high durability. While traditional catalysts faced the issue of deteriorating long-term durability when the amount of iridium is reduced, Ir/ENETIA® successfully stabilizes the chemical state of the special titanium oxide carrier and iridium by introducing a unique bound state between them, thus achieving both high activity and durability with a small amount of iridium (Figure 3). Additionally, as this newly developed catalyst is a powdered catalyst, which conforms to conventional water electrolysis catalysts, it can be used for the "roll-to-roll" screen printing method advantageous when scaling up Catalyst Coated Membranes (CCM).

4. Future Prospects

Sakai Chemical Industry has already begun providing samples with the aim of establishing a mass production system in the near future. With this development, we aim to boost the proliferation of water electrolysis devices to help achieve carbon neutrality using hydrogen, a next-generation energy source.

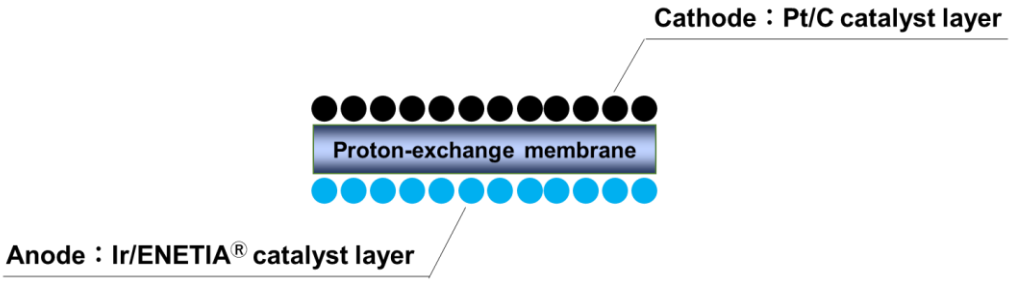

Figure 1: Schematic diagram of the CCM.

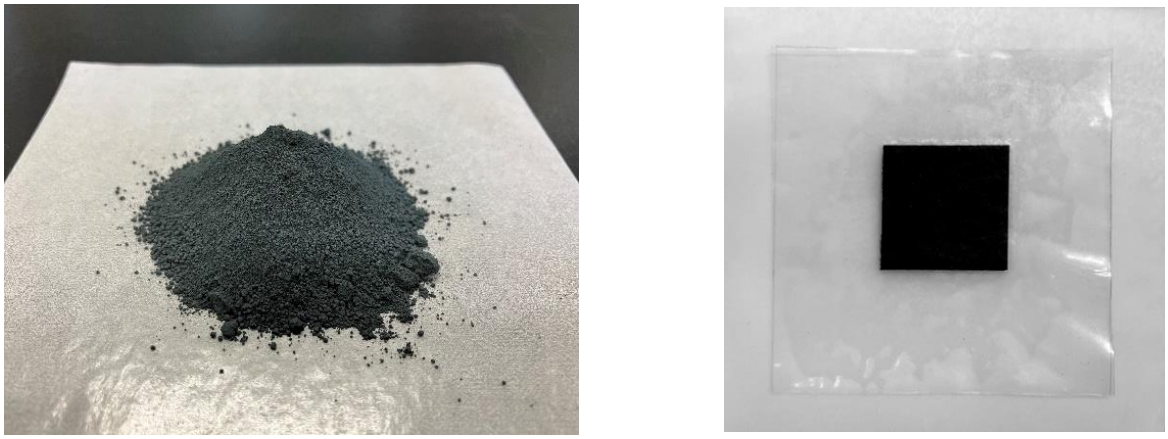

Figure 2: Photographs of the catalyst developed (left) and the CCM (right).

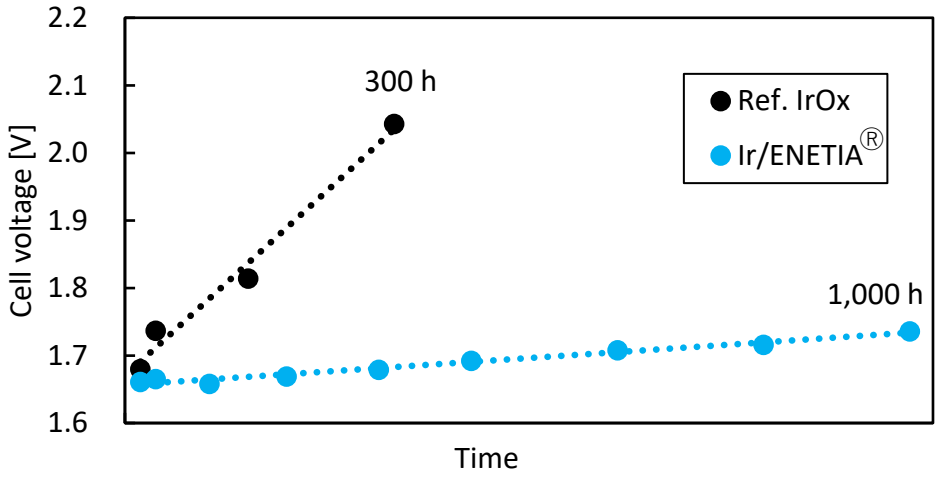

Figure 3: Water electrolysis durability test for IrOx (commercially available) and Ir/ENETIA® (60°C,　2.0 A/cm²)

*Comparison at 1/10 the conventional Ir catalyst amount (*the general catalyst amount as of 2022)

*Over time, the product developed by Sakai Chemical Industry (Ir/ENETIA®) showed a significant suppressed voltage increase compared to the conventional product (Ref.IrOx), demonstrating higher durability.

<Inquiries>

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