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Meidensha Corporation

Meidensha selected for NEDO Feasibility Study Program jointly with universities

Industry-academia team aims to develop PFAS self-concentrating rotating disk plasma decomposition and detection system

A joint proposal from Meidensha Corporation, Chuo University, Institute of Science Tokyo, and Kanazawa University to decompose harmful per- and polyfluoroalkyl substances (PFAS) for detoxification has been accepted into the Feasibility Study Program sponsored by the New Energy and Industrial Technology Development Organization (NEDO).

The project, proposed to NEDO's Feasibility Study Program on Energy and New Environmental Technology, aims to develop a PFAS self-concentrating rotating-disk plasma decomposition and detection system capable of decomposing I-C1 PFAS for detoxification.

The feasibility study is expected to run for up to three years starting in fiscal 2025. It will focus on core technologies for PFAS decomposition to reduce environmental impact and enable circulation of fluorine resources.

- Background

  PFAS are a group of chemical compounds composed primarily of carbon and fluorine. Their exceptional chemical stability makes them resistant to heat and many chemicals, so they have been widely used in industry (e.g., semiconductors and telecommunications) and in everyday products.

  PFAS, however, are highly soluble in water and extremely persistent in the environment, which raises concerns about contamination of drinking water and rivers. Two well-known PFAS, PFOS and PFOA, have raised health concerns. As a result, proposals are under consideration to restrict their manufacture, use, and trade under international frameworks such as the Stockholm Convention on Persistent Organic Pollutants and the EU REACH Regulation.

Many countries have already set concentration limits for PFAS in drinking water and the environment and are likely to tighten those limits further.

Current PFAS management relies on removal technologies—activated carbon adsorption, ion exchange, and reverse osmosis—and on high-temperature incineration for destruction. However, treatment residues can still contain PFAS, and incineration is energy-intensive and costly. In some applications, such as semiconductor manufacturing, suitable non-PFAS alternatives do not exist. Therefore, there is strong demand for economically viable technologies that can effectively decompose and detoxify PFAS.

■ Overview of the development

This feasibility study aims to develop a self-concentrating rotating-disk plasma decomposition and detection system for reverse-osmosis (RO) concentrate produced during semiconductor and fluorochemical manufacturing. The system will integrate the following technologies to achieve complete detoxification:

1. Pretreatment for coexisting substances in water
2. PFAS adsorption technology
3. PFAS decomposition using plasma
4. Rapid measurement of PFAS concentration in water to be treated

Meidensha will develop the plasma-generating power supply for items 1 and 3, leveraging its technology and experience from the Pure Ozonated Water Generator*1 and Pulse Power Supply*2.

■ Future prospects

The industry-academic team will advance core technologies over the three-year feasibility study, and then optimize the system for a demonstration phase. The project will be scaled up with a view to realizing chemical recycling by recovering fluorine after PFAS decomposition, while accumulating operational experience ahead of anticipated PFAS emissions standardization.

*1: Pure Ozonated Water Generator

Generates ozonated water using nearly pure ozone gas (≒100%) at atmospheric pressure, achieving world-class ozone concentrations safely. It is used as an

alternative to chemical treatments and for material processing in semiconductor and industrial manufacturing.

*2: Pulse Power Supply

Delivers short-duration, high-voltage pulse power on microsecond to nanosecond timescales. It is used as a plasma drive power source across a range of industries, including semiconductor manufacturing.