



September 26, 2023

**Japan's First*¹ Development of Heavy Water Reconcentration Equipment and
Establishment of a Sustainable Recycling System
-- Equipment Reinforcement to Strengthen the Supply Capacity of Deuterium-Labeled
Compounds*² --**

Taiyo Nippon Sanso Corporation (President: Kenji Nagata; hereinafter “TNSC”), a Japanese industrial gas company in Nippon Sanso Holdings Group, has developed an equipment that can reconcentrate the used heavy water that were previously disposed of in the past, and has established a heavy water recycling system. TNSC is the first Japanese company to commercialize heavy water reconcentration. The establishment of the recycling system will reduce the amount of waste heavy water, enable efficient and sustainable use of heavy water, and contribute to the stabilization of the supply of deuterium-labeled compounds to meet domestic and international demand.

Note *1: Based on the research of TNSC

*2: Deuterium-labeled compounds is a general term for compounds in which some or all of the hydrogen atoms in the compound are replaced by deuterium (D).



Heavy water reconcentration equipment (exterior view)

1. Background

Heavy water is water that contains a large amount of deuterium, a stable isotope of hydrogen. It is used in a variety of research fields including nuclear energy and the research of solvent for NMR analysis. In addition to deuterated ammonia,^{*3} we manufacture and sell a wide variety of deuterium-labeled compounds, while using heavy water as a source of deuterium for these compounds.

The process of producing deuterium-labeled compounds involves deuteration reactions in which hydrogen atoms are replaced by deuterium atoms. These reaction become more efficient as the concentration of deuterium in the heavy water used as a raw material increases. This is due to decreased concentration as the reaction progresses, and becomes necessary to replace the heavy water with a new batch. Until now, most of the heavy water that were used once and with low deuterium concentration were disposed of. In addition, heavy water is not an easy substance to obtain on a stable basis, as it is susceptible to overseas supply and demand conditions and the export policies of the countries it sourced from. Japan now relies on imports from abroad for all of its domestic needs for heavy water.

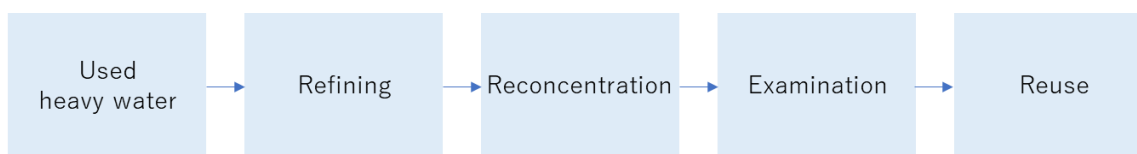
Note *3: [News Release dated May 31, 2023, “Notice Regarding Launch of Deuterated Ammonia \(Ammonia-d₃\)”](#)

2. Overview and future plans

We have applied our own technology to develop equipment for reconcentrating the heavy water that has been used for research, deuteration reaction, and other purposes, and have established a system for recycling heavy water at the Tsukuba Laboratory. Since used heavy water after a deuteration reaction contains various impurities depending on its history, impurities are first removed through a purification operation.

Then, the deuterium-enriched heavy water is obtained through a distillation-based reconcentration equipment developed in-house. This equipment is capable of both continuous and batch processing, achieve atomic deuterium concentration greater than 99% in reconcentrated heavy water, and have an annual production capacity of 150 kg. By using this recycling system, a portion of the heavy water used for deuterium-labeled compounds can be sourced in-house, and the amount of waste heavy water is expected to be reduced by half compared to our previous system.

Going forward, we will continue to maintain stable operation of the reconcentration equipment, explore heavy water reuse needs outside the company, and study ways to increase production in response to demand.



Recycling process for used heavy water

【Company Overview】

Taiyo Nippon Sanso Corporation

Business description: Manufacture and sale of various industrial gases such as oxygen, nitrogen, argon, LP gas, gas for medical uses, and specialty gases, manufacture and sale of welding equipment and materials, gas-related devices, and, air separation equipment, assembly, processing, inspection of electrical components, and equipment maintenance

Established: October 30, 1910

Incorporated: February 4, 2020

Capital: 1.5 billion yen

Shareholder: Nippon Sanso Holdings Corporation (Investment ratio: 100%)

Revenue: 420.4 billion yen*

*Note: This figure shows the revenue of Japan for Nippon Sanso Holdings Corporation in FYE2023

Taiyo Nippon Sanso Corporation

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