

§23. Investigation of Tritium Behavior at D-D Burning Experiment in LHD and Study on Recovery, Treatment and Disposal Methods of Tritium

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Deuterium-deuterium burning experiments at the Large Helical Device (LHD) are being planned by the National Institute for Fusion Science (NIFS). Tritium will be produced by the D-D fusion reaction during the experiments, though the amount is estimated to be small. A part of tritium produced in the vacuum vessel of LHD will be retained in the plasma facing components and structural materials, and the rest will be exhausted to the tritium recovery system via the vacuum systems. It is also anticipated that a part of tritium will be transferred to the cooling water after permeation through the wall of cooling devices. Therefore, this research group is formed to understand tritium behavior inside of the LHD vessel and to establish the feasible methods of recovery, treatment and disposal of tritium produced in the LHD facility from the view point of technology and the social acceptance.

The main purpose of the present investigation is

1. to develop the quantitative analysis method for estimation of the amount of tritium in various places of LHD,
2. to develop the tritium measuring method at various places of LHD,
3. to develop the tritium recovery method from various places in LHD,
4. to develop the method to recover tritium transferred to the vacuum system and cooling system of LHD, and
5. to develop the safety treatment and disposal methods of

recovered tritium feasible from the view point of technology and social acceptance.

The meeting for the investigation was held on September 18-19, 2001 at Hokkaido University. Many researchers participated from Hokkaido University, Ibaraki University, the University of Tokyo, Toyama University, Shizuoka University, Nagoya University, Kyoto University, Osaka University, Kyushu University; NIFS, the Japan Atomic Energy Research Institute (JAERI), and some private companies. The total number of the participants was 32.

In the meeting, following subjects were discussed;

- 1) tritium handling experiment and achievements at the University of Tokyo,
- 2) design study of processing systems at NIFS for tritiated exhaust gas and liquid during D-D experiments in LHD and their future plan,
- 3) results of experiments about tritium-Flibe research done at the Idaho National Environmental and Engineering Laboratory in the frame work of the Jupiter 2 US-Japan co-operation program,
- 4) recent research in Hokkaido University about PWI problems,
- 5) experiment about tritium permeation through the concrete wall performed at the Kyushu university, and
- 6) present situation of the ITER program.

It was recognized from these discussions that the data base and experiences related to tritium traceability and management in the nuclear and accelerator facilities is very useful for those in the LHD facility during D-D experiments and fusion reactors.

It was concluded through the discussion that the research and development planning of tritium gaseous and liquid wastes processing systems proposed by NIFS was appropriate to perform early and safely D-D experiments at LHD with help from various tritium handling facilities in Japan. It was also recognized that more data base and experiences related to tritium recovery and management, besides the data base about tritium behavior in the fusion device are required for understanding of tritium behavior both in the LHD facility during D-D experiments and fusion reactors, in spite of the large difference in amount of tritium to be handled.