§6. Studies on Establishment of Database Concerning Tritium Safety Issues for Fusion Facilities

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1. Introduction

A series of Deuterium-Deuterium (D-D) plasma experiments has been planed at LHD (Large Helical Device). It has thus been significant to establish the handling technologies for tritium produced by the D-D experiments. Although the amount of tritium is quite small, it is essential to get common understandings on the tritium safety from residents. In addition, it is quite significant that a set of data for the tritium safety should be obtained in Japan not in foreign countries. The tritium safety data have been arranged mainly by JAEA to construct ITER in Japan. However, ITER is constructed in France. If the tritium safety data are not arranged now, there is possibility that the data are scattered and lost. The principal objective of this study is to construct a database for the tritium safety from the data previously obtained in Japan. It is also a future goal of this study to collect the database to a guideline for the tritium handling in fusion facilities in Japan.

2. Background

The tritium safety data is considered to be composed of the followings: basic tritium characteristics (physicochemical properties, characteristics as radio isotope); fuel processing and safety handling technologies; monitoring methods in environment; and biological hazard of tritium. These data have been obtained through the studies on tritium in Japanese universities and institutes for a long period. A set of tritium handling technologies has also been obtained in the tritium facilities in Japan, which are the maintenance methods, failure data, and results of operation for the tritium contaminated components. Recently, a resource was committed to get the tritium safety data related to a licensing for ITER construction in Japan. The amount of tritium produced in the D-D experiments at LHD is estimated to be 56 GBq/year, and is quite trace amount in comparison with ITER. However, the D-D experiments are quite unique studies from viewpoints of tritium handling in a plasma facility in Japan. To accomplish the present study, we can clarify the subjects remaining in the tritium safety. To overcome the subjects, we can construct a real database of tritium. The tritium database should be a significant guideline for the D-D experiments at LHD. It is also expected that the database should become a baseline of the tritium safety guideline for a future fusion demo reactor.

3. Result and Discussion

The members of the present study are key experts of tritium technologies in Japan. As the result in the last year, we obtained a common understanding for the tritium technologies for fusion facilities. In this fiscal year, workshops for the present study were held on June, October of 2007, and February of 2008. As the result, the present status and future subjects on the following major filed of the tritium technologies have been well understood: basic tritium properties, tritium-materials interactions; fusion fuel processing technologies; tritium safety technologies (confinement, contamination and decontamination, accountancy, waste management, etc.); and environment monitoring; biological hazard. The above results made a set of great contributions to the discussions on the research subjects carried out in BA (Broader Approach) program. A series of basic studies on the tritium technologies for DEMO fusion reactors will be carried out at a tritium facility in Rokkasho since 2011 in the BA program. In addition, as a result of the present study, a review report has been published in the Journal of Plasma Fusion Research [1]. A writing work has also been continued to publish a series of review reports for the present status of the tritium technologies as an activity of the present study.

[1] T. Yamanishi, et al., J. Plasma Fusion Res. 83 (6) (2007).