§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 part of the studies have been carried out in several tritium facilities handling a large amount of tritium. A set of tritium handling technologies has also been obtained in the facilities, 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

Workshops for the present study were held on June, and September of 2006, and January and March of 2007. In these workshops, it has been detailed discussed subjects and construction method for the tritium database. The database should include the following contents: basic tritium properties (physicochemical and radiochemical); tritium-materials interactions; fusion fuel processing technologies (impurity removal and recovery, isotope separation); tritium safety technologies (confinement, contamination and decontamination, accountancy, waste management, etc.); environment monitoring; biological hazard. Recently, a tritium manual has been compiled in EU. However, the manual is for the construction of the ITER tritium plant. In the above workshops, it has been agreed that the tritium database should be constructed in the present study from viewpoint of the tritium science. As the first step of the present study, we will review the obtained results for tritium science. The R&D subjects at ITER and those towards a demo plant are then discussed for each contents described above. These results through the present study will be published in several scientific journals in the next fiscal year.