

§5. Research on Oxidation Factors of Tritium Gas and Fluctuation Factors of Tritium Level in the Environment

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A great amount of tritium will be used in the future fusion reactors as fuel. Tritium release field experiments were conducted in France and Canada to study the environmental behavior of tritium gas and some members (JAERI and Ibaraki Univ.) of this research group had joined in the 1994 tritium gas chronic release experiment in Canada. However, there is or will be no field release experiment of tritium in Japan due to public acceptance whereas investigations on tritium behavior depending on the local environmental conditions are now needed. Thus recently we have conducted heavy water (D_2O) vapor release field experiments using deuterium as a substitute for tritium. On the other hand, developments of convenient (relatively easy to use) code for dose assessment are also urgently needed and the meeting on dose assessment codes was held at NIFS gathering with tritium researchers and model specialists.

Heavy water vapor release field experiments

In this year release experiments, D_2O vapor was released into two open top vinyl-circle set up separately on the ground of the Mito campus of Ibaraki University. The size of the circles was 2.4 m in height and 5.8 m in diameter. One circle was used for daytime release experiment of D_2O and the other one for the nighttime release. Main items of research were (1) the measurements of meteorological conditions and the distribution of air D_2O concentration in the circle, (2) D_2O transfer during daytime and nighttime into vegetation and their reduction, (3) OBD formation in vegetation, (4) D_2O deposition in soil and its re-emission, and (5) D_2O transfer into rats.

The meeting on dose assessment codes

The titles and contents of the meeting held on January 29, 1999 were as follows.

1. View of Dose Assessment Model. Takahashi, T. (JAERI)

Concerning with the safety assessment of tritium, outline of dose assessment system, the compartment model used for assessment, treatment of uncertainties of dose assessment system and the relationship between dose assessment system and basic studies on the behavior of

nuclides in biosphere were presented.

2. Development and validation of an environmental tritium model; ETDOSE. Andoh, M., Takahashi, M. and Amano, H. (JAERI)

ETDOSE is a simple computer code to calculate atmospheric distribution patterns of tritium for an acute and a chronic release of HT and HTO. This code calculates tritium concentrations in air, soil, plant free water and OBT, and estimates dose impact by inhalation of air and ingestion of food. ETDOSE has been verified by model comparison in IAEA's model validation program BIOMASS.

3. Development and Validation of a Code for Dose Assessment to the Public due to Acute Tritium Release (ACUTRI). Noguchi, H. (JAERI)

In order to establish dose assessment methodology to the public due to tritium released to the atmosphere, a tritium dose assessment code named ACUTRI has been developed and validated using data of the tritium release experiment in Canada.

4. Modelling of tritium dispersion in vicinity of nuclear fusion facility. Murata, M. (JAERI)

A model for cycling of tritium in the environment near nuclear fusion facilities was developed considering possible items relating to tritium behavior. And it was applied to the experimental data to determine diffusion coefficients and oxidation rate constants of HT in soil. These parameter values and the model were used for prediction of environmental tritium dispersion.

5. Development and verification of water and tritium circulation model, SOLVEG. Yamazawa, H. (JAERI)

A one-dimensional, multi-layer, numerical model describing the circulation of water and tritiated water in the atmosphere-soil-vegetation system is being developed and verified. Although the development are still under way, the model simulation has shown promising results.

6. Internal dose estimation of tritium by using ERMA. Takeda, H. (NIRS)

ERMA (Environmental Radionuclides Movement Analysis Code System) was developed for internal dose estimation after intake of radionuclides in NIRS. By using the ERMA system we evaluated internal doses for tritium intake by Japanese general public.

7. Meteorology at Toki. Sakuma, Y. (NIFS)

At NIFS, we are planning to carry out DD experiment using LHD in the near future. A small amount of tritium will be potentially released in the atmosphere. To assess the influence of the tritium, we have been meteorological observation in the site.

8. Introduction of UFOTRI: Program for assessing the off-site consequences from accidental tritium releases (W. Raskob). Ichimasa, Y. (Ibaraki Univ.)

UFOTRI is used as the reference code for the International Thermonuclear Experimental Reactor (ITER).