

【Grant-in-Aid for Scientific Research(S)】
Science and Engineering (Engineering II)



Title of Project : Basic Studies for Developing Rational Treatment and Disposal System of Radioactive Wastes Generated by Fukushima Nuclear Reactor Accident

Yasuhisa Ikeda
(Tokyo Institute of Technology, Research Laboratory for Nuclear Reactors, Professor)

Research Area : Synthetic Engineering, Nuclear Energy

Keyword : Back-end

【Purpose and Background of the Research】

One of urgent subjects for recovering Fukushima reactor accident is to treat highly contaminated solid and liquid wastes in the nuclear reactor sites. However, the properties of these radioactive wastes are different from those of wastes generated from reprocessing processes. Hence, we need to newly acquire scientific information on radioactive wastes generated by reactor accidents. In the present study, we will perform basic studies for developing the rational management system for the target radioactive wastes with consistency in the treatment methods and final disposal.

【Research Methods】

In order to achieve the objectives in the present study, following three research themes will be performed with the mutual consistency.

1.1 Studies on properties of contaminated materials (solid): In order to clarify properties of solid wastes contaminated fuel component and fission products, we will prepare the simulated materials based on the expected accident conditions, and examine their properties.

1.2 Studies on properties of contaminated materials (liquid): In the initial stage of reactor accident, sea water was injected into reactors for cooling fuels. Hence, dissolution of fuels with the oxidation of UO_2 , dispersion of nuclides, *etc.* are expected to be occurred. We will examine the solubility of Cs(I), Sr(II), Pu, *etc.*, their chemical forms in cooling water to clarify the composition and properties of contaminated water.

2.1 Studies on treatment methods of contaminated materials (solid): The highly contaminated solid materials in the reactor accident are expected to be not decontaminated by conventional methods. And also the solid wastes (zeolite used as Cs adsorbent *etc.*) should be solidified by vitrification. Hence, we will study decontamination methods using ionic liquids or supercritical CO_2 , and also perform the basic study for developing vitrification method.

2.2 Studies on treatment methods of contaminated materials (liquid): In order to cool the reactor safely and reduce the load of final disposal, the

contaminated cooling water must be treated effectively. Here, we will carry out studies for developing high performance adsorbents for Cs(I), Sr(II), α -nuclides, *etc.* and the treatment methods of such adsorbents.

3. Study on final disposal: Experiments for obtaining necessary data for establishing the final disposal system will be performed. Based on experimental results and conventional disposal methods, we will examine the final disposal methods for the radioactive wastes generated from Fukushima reactors and propose the appropriate disposal system.

【Expected Research Achievements and Scientific Significance】

- Acquisition of scientific data on properties of contaminated materials generated by the reactor accidents → development of the advanced decontamination methods.
- Establishment of rational management system for the wastes generated by the reactor accidents → proposal of such a system to the world.
- Offer of basic data for the objective assessment of the methods which will be proposed for decommissioning Fukushima reactors.

【Publications Relevant to the Project】

- The Application of Novel Hydrophobic Ionic Liquids to the Extraction of Uranium(VI) from Nitric Medium and a Determination of the Uranyl Complexes Formed. T.J. Bell and Y. Ikeda, *Dalton Trans.*, **40**, 10125-10130 (2011).
- Selective Uptake of Cesium Ions on AMP-loaded Silica Gels. Y. Endo, Y. Wu, H. Mimura, *et al.*, *J. Ion Exch.*, **18**, 300-305 (2007).

【Term of Project】 FY2012-2015

【Budget Allocation】 156,300 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.nr.titech.ac.jp/~yikedada/yikedada@nr.titech.ac.jp>