

Radiochemical Analysis of Tritium for ITER Type B Metallic Radwastes

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In order to test a possibility for scientific and technical development of fusion technology, ITER (International Thermonuclear Experimental Reactor) was established by the cooperation group comprised of European Union, China, India, Japan, Russia, U.S. and Korea, and is currently preparing the construction of the fusion reactor aiming at a first plasma in 2019 or later. Moreover, researches for radwaste treatment/disposal generated in the future as well as developments of the fusion technology are being carried out in ITER and associated institutes. Therefore, ITER is now trying to develop destructive and non-destructive methods of tritium measurement for the discarded radwaste components. The major ITER Type B (medium activity with long life) metallic radwastes that need tritium measurement are mostly Divertor Cassette Body, Blanket Modules, Test Blanket Module Port Plug, Torus Cryopump, etc. It has been known that 10^7 Bq/g of tritium is distributed within 1 mm depth from the surface of the metallic radwastes. The metallic radwastes generated from maintenance period of ITER facility will be transferred to the Hot Cell Facility (HCF) for treatment including cutting, tritium removal and pre-packaging, followed by shipping to the disposal facility after interim storage at ITER site.

In this study, the radiochemical analysis methods of tritium measurement for ITER type B metallic radwastes were reviewed. Especially, two experimental methods of chemical acid leaching method (CALM) and heating method (HM) were compared with each other to suggest the most suitable method for tritium measurement. The recovery yield of tritium standards for CALM and HM showed excellent results of 98 and 90 %, respectively. Since HM requires the post treatment of extracted tritium species due to impurities, as shown in the analysis of sample from Nuclear Power Plant, CALM was considered more efficient method than HM for tritium analysis of Type B metallic radwastes.