IFERC Newsletter

IFERC-N-2020-2, July 2020
International Fusion Energy Research Centre, Rokkasho, Aomori 039-3212, Japan

Meeting

Press release from JET-ILW sample analysis by EU-JA collaboration

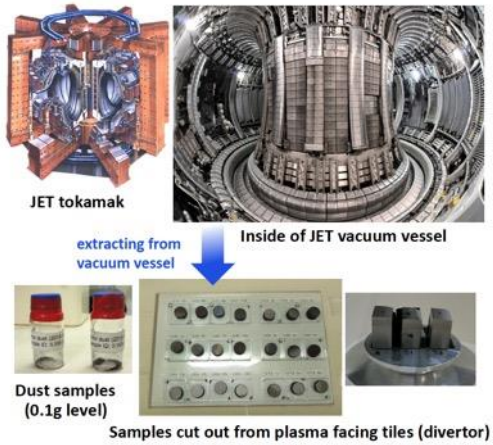
Achievement of new microanalysis on fuel tritium retention in metal dust for the fusion reactor

In July 2020, Fusion for Energy and QST had a press release of significant results from the comprehensive analysis of tritium retained in the experimental device, JET ITER-like wall (ILW). Samples of the plasma facing wall and dust were transported to QST Rokkasho Fusion Institute, which is a unique capability among the world research facilities as it can handle simultaneously radioactive tritium and beryllium materials, and comprehensive analyses have been carried out. In particular, the development of the new micro-analysis techniques and evaluation of tritium retention in small amount of metal dust samples (one to a few mg) were unique achievements in the world.

Since the year 2014 till today, the experts in QST, National Institutes of Natural Sciences National Institute for Fusion Science (NIFS) and the universities (Ibaraki University, University of Toyama, Shizuoka University, Kindai University and Shimane University) as well as the experts in Europe have joined and conducted the sample analysis in various ways using a sensitive film (imaging plate), a combustion method, electron microscopes, etc. in order to understand how tritium and deuterium are retained on the surface of the wall materials and dust generated in the JET vacuum vessel.

The joint team of JA and EU researchers have successfully evaluated the amount of tritium retained in the micro-sized metal dust particles, for the first time in the world, by developing two new microanalysis techniques, i.e. a “combustion method”, to evaluate the total amount of tritium retained inside a small amount of dust particles, and a “new imaging technique” that simultaneously shows the source elements (beryllium, tungsten, carbon, etc.) of many dust particles and the distribution of tritium concentration.

In ITER, the total amount of the tritium retention inside the vacuum vessel is restricted to below safety standards (1kg) for the radioactive materials. It is a crucial issue to develop high accuracy evaluation method of the total tritium retention amount because tritium accumulates gradually during operation on the surface of plasma facing materials and in the micro-sized dust particles generated from them. JET is a unique experimental device in the world, which installs the same metal protective tiles (tungsten and beryllium) adopted by ITER. A small amount of tritium was generated during the operation and it is retained on the surface of the tiles and in the dust. The results obtained from the JET sample analysis make a substantial contribution to the improvement of evaluation model for tritium retention in the ITER vacuum vessel. The results also support the current estimation of tritium retention in the ITER vacuum vessel, and make a substantial contribution to the operation management for ITER and future fusion reactors.



(Left) JET and samples of the plasma facing tiles. (Right) JA and EU experts in the joint analysis, 2019 Dec.

https://fusionforenergy.europa.eu/news/experts-measure-the-tritium-retained-inside-dust-particles-produced-in-a-tokamak/
https://www.qst.go.jp/site/press/41989.html