Contribution ID: **77** Type: **not specified**

[P12] Development of activation detector for ultra-long term DT neutron irradiation

Thursday, 18 November 2021 16:00 (2h 30m)

In the material integrity test of fusion reactors, neutron irradiation and cooling are repeatedly performed. In the test, it is indispensable to obtain the neutron fluence by some method. Commonly, Nb foil is used for neutron flux measurement, however one Nb foil cannot record a long irradiation period of about one year, because the half-life of produced RI is about 10 days. Relative measurement with an MCS is available, however it is often complicated due to instability of the detector output and data processing. In this study, we develop an activation detector to determine the neutron fluence, even if the irradiation period is extremely long, using nuclides with very long half-lives. First, we selected nuclides whose produced radioisotopes emit γ-rays similar to Nb foil. As a result of selection, 33 nuclides were selected as possible γ-ray emitters. For one year irradiation of ITER materials at the DT neutron source facility, OKTAVIAN, only 103Rh was found to be effective. 103Rh(n,2n) reaction produces 102mRh having a half-life of 3.7 years. However, for various irradiation conditions of various durations and neutron intensities, e.g., irradiation in ITER, only γ-ray emitting nuclides were found to be insufficient. In order to increase the number of candidates, β-ray emitters were also examined. As a result, 15 β decay nuclides were selected. 158Tb, which is produced by (n,2n) reaction of 159Tb, has a half-life of 180 years and can be applied to ITER for an irradiation period of several tens years. At present, we are measuring the accurate cross sections of 103Rh(n,2n) and 159Tb(n,2n) reactions at 14 MeV by a short-term irradiation. In addition, long-term irradiation of several months is being carried out with these foils. By the long-term irradiation experiment, we aim to prove the applicability of these foils as activation detectors in an ultra-long-term DT neutron irradiation.

Primary author: Mr IWANAKA, Yoshihide (Osaka University)

Co-authors: EGUCHI, Ryota (Osaka University); TAMAKI, Shingo (Osaka University); KUSAKA, Sachie (Osaka University); SATOU, Fuminobu (Osaka University); MURATA, Isao (Osaka University)

Presenter: Mr IWANAKA, Yoshihide (Osaka University)

Session Classification: Poster ポスター