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M2Or1C-01: Neutron irradiation effect on critical current of Nb3Sn wire under 8 T to 15.5 T at 5 K

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Nb3Sn superconducting wires are used for TF coils of ITER. Since fusion neutrons will stream out of a plasma vacuum vessel and reach TF coils, the conductors will be irradiated by the neutrons. The bronze-root Nb3Sn wire and the internal-Sn Nb3Sn wire were neutron irradiated at a fission reactor in Belgium and the critical current of the irradiated samples were evaluated with 15.5 T superconducting magnet and a variable temperature insert at Oarai center of Tohoku University.
The ratio of the critical current of the irradiated (4.9E+22 n/m2, > 0.1 MeV) sample to that of non-irradiated sample, which was manufactured by the bronze process, was evaluated, and it was found that the ratio was almost constant of 1.75 under 8 T to 15.5 T at around 5 K. The result was plotted on the diagram between the current ratio and the neutron fluence. The data obtained at Kyoto University Reactor (KUR) under 6 T at 4.5 K using the bronze-root Nb3Sn wire showed a good agreement with the data in the present study. The change in the critical current is almost constant in the wide magnetic field up to 15.5 T and it shows that the number of pinning site increased as the irradiation defects increased, and that the pinning force would be strengthened by the increased pinning site. The detailed discussion will be presented at the conference.

Author: NISHIMURA, Arata (National Institute for Fusion Science)

Presenter: NISHIMURA, Arata (National Institute for Fusion Science)

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