Contribution ID: **62** Type: **Poster**

# Diffusion of tritium produced in a graphite and SiC target

*Tuesday, 5 June 2018 18:30 (10 minutes)*

Tritium is known to be generated in a target material like graphite by a nuclear reaction due to hadron beam irradiation. It is pointed out that such a tritium diffuses in the high temperature graphite exposed by a high power beam, and then evaporates to the beam line vacuum. Hence such a tritium has possibility to cause an unexpected leakage and/or contamination trouble. In a sense of radiation safety, the knowledge of tritium diffusion is essential to develop the target in high power beam facilities like J-PARC Muon Facility.
As a candidate material of the first wall of nuclear fusion reactor, many studies were performed on the hydrogen isotope diffusion in graphite, although the diffusion coefficient shows the strong dependence on samples, i.e. single or poly crystal, grain size of crystal, concentration of the vacancies and so on. Such sample dependence can be explained by the tritium diffusion through the grain boundaries and trap in the vacancies. However, we are still far from the comprehensive and quantitative understanding, and this puts an uncertain risk factor to the development of the next-generation target system as well as the operation trouble at present.
We are planning to perform a study of hydrogen isotope diffusion in graphite using a muon and a positron beam. A positively-charged muon injected into a material acts as a light isotope of hydrogen, and thus muon informs the microscopic behavior of the hydrogen isotope. In addition, a positron gives the information about the concentration of the hydrogen trapped in a vacancy by the change in its life time due to the enhancement of annihilation by the trapped hydrogen.
We will present the details of the planned study about the hydrogen isotope diffusion in graphite and also SiC.

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**Session Classification:** Poster Session and Reception