

# **Tritium Balance in a DT Fusion Reactor**

Masabumi Nishikawa

*Graduate School of Engineering Science ,Kyushu University*

*6-10-1 Hakozaki, Higashi-ku, Fukuoka 812-8581, JAPAN*

## **Abstract**

The amount of tritium bred in the breeding part of blanket system of a fusion reactor must exceeds the amount of tritium consumed in the reactor and the remainder is stored for the initial inventory of the next reactor to be constructed. It is found recently that no small amount of tritium is trapped to the re-deposition layer of the first wall material of the plasma vessel. It is also anticipated that some amount of tritium is lost from the plasma driven permeation through the first wall material of the plasma vessel when the wall temperature becomes higher.

The tritium balance in a DT fusion reactor is discussed in this paper comparing the amount of tritium consumed in the fueling cycle including the plasma vessel with the amount of tritium generated in the blanket system using the information reported so far. It is shown in this comparison that the overall burning efficiency of tritium in the plasma vessel, the tritium loss ratio represented by tritium trapping into the re-deposition layer of the plasma facing material and the recovery efficiency of tritium from the trap together with the tritium breeding performance in the blanket system play important roles in the tritium balance and that it may not be easy to keep the tritium economy of a DT fusion reactor in a good condition if combination of proper burning efficiency, proper tritium loss ratio and proper tritium recovery efficiency are not obtained. The allowable limit for the overall tritium burning efficiency, that for tritium loss ratio in the fueling cycle and that for the recovery efficiency to secure the self-sustainable tritium system are also discussed in this paper.