In-pile functional tests of breeding blankets have been planned by Japan Atomic Energy Agency (JAEA), using a test blanket module (TBM) which will be loaded in ITER. In preparation for TBM, JAEA is performing irradiation experiments of solid breeder materials including Li$_2$TiO$_3$, which is the first candidate of breeder materials for the DEMO blanket in a water-cooled solid-breeder design concept. The present paper deals with design and trialfabrication works for developing a dismantling apparatus for irradiation capsules which were used in irradiation experiments using the Japan Materials Testing Reactor (JMTR) of JAEA.

The irradiation capsule is comprised of a cylindrical outer-container (65 mm in outer diameter) and an inner-container which is loaded with Li$_2$TiO$_3$ pebbles. Tritium generated in the Li$_2$TiO$_3$ pebbles was swept with purge gas during and after the irradiation. The dismantling process, however, leads to release of tritium which is left in the free volume of the capsule, as well as a portion of tritium which is left in the breeder pebbles.

In the present design, the irradiation capsule is cut by a band saw; the released tritium is recovered safely by a purge-gas system, and is consolidated into a radioactive waste form. The dismantling apparatus has enough confinement capability with a He-gas leakage rate smaller than $10^{-8}$ Pa·m$^3$/s. Furthermore, an inner-box enclosing the dismantling apparatus has been designed as a countermeasure of possible release of tritium in incidental and accidental events. The adoption of the inner-box has lead to elimination of expensive refurbishing works of the existing hot cell equipped with usual wall material (i.e., painted concrete), which is permeable to tritium. Good performance of a model of the dismantling apparatus prepared as a trial fabrication has been demonstrated by cold (non-radioactive) cutting runs using some simulated irradiation capsules.

Thus, the present work has indicated the feasibility of the dismantling apparatus for the irradiated JMTR capsules containing tritium. The design of the apparatus, together with experience of the trial cold runs, will contribute to the design of the TBM structure and to the planning of the dismantling process of the TBM.

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