

R&D status of key technologies for the development of KO TBM

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Among the technologies for the development of solid breeder blankets, a few technologies are chosen focusing on the Korean Helium Cooled Solid Breeder (HCSB) Test Blanket Module (TBM) development. It has been designed accounting for the performance of DEMO-relevant blanket. The HCSB TBM uses helium with a few percent of hydrogen as purge gas. The lithium ceramics breeder and graphite neutron reflector are used in pebble-bed forms. One of unique features of the TBM is that a reflector is used to reduce the amount of beryllium. Silicon-carbide coating on the graphite pebble is considered to prohibit the reaction of graphite with steam or air.

R&D activities currently being undertaken for HCSB TBM include breeder pebble material development, measurement of pebble bed characteristics, joining technologies of structural material, and deuterium permeation study in the breeder purge gas line. The TIG joining performance of FM steel is evaluated. Lithium silicate and lithium titanate pebble fabrication methods are under development using special fabrication process, and the initial characteristics of the pebbles are assessed. Especially, the method of silicon carbide coating on the graphite pebble is investigated, and its possibility is verified based on the coating results on the graphite plate. Since the thermal properties of the pebble bed depend on the packing method, shape of the bed, etc, the measurement method and database of the thermal properties of the pebble and pebble bed are important for the design of TBM as well as breeding blanket. The permeation of tritium bred in the breeder has to be protected and the permeation characteristics are assessed. The experimental apparatus for the pebble bed characteristics measurement and permeation study are setup, and the initial test is performed. The current results of these R&D issues will be addressed in this paper.

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