

Overview of Liquid Metal TBM Concepts and Programs*

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In support of the ITER Test Blanket Module (TBM) program, ITER party members have been focusing on the liquid metal blanket design concepts that have been extensively explored. With the use of reduced activation structural materials, we are designing to respective maximum allowable temperatures. For fusion power reactor designs, we will have to remove the first wall heat flux, breed adequate tritium for the D-T fuel cycle and achieve high coolant outlet temperature for high power conversion efficiency. After a period of assessment, we have selected liquid metal blanket concepts that can achieve these design requirements for respective DEMO designs. The objectives of our work are to establish the main characteristics of different proposed liquid metal blanket concept systems to be tested in ITER. We have identified compulsory design requirements from respective domestic DEMO strategies, completed the conceptual design of respective liquid metal TBMs, and identified necessary R&D programs. All liquid metal TBMs have the potential of meeting similar DEMO goals and requirements. All liquid metal TBM designs are to satisfy ITER safety requirements. Many R&D elements are common to a few designs such as the ferritic steel (FS) or V-alloy fabrication, thermal fluid MHD, FS/PbLi, FS/Li and V-alloy/Li compatibility, irradiation effects, tritium extraction, etc. With a well-coordinated ITER TBM program, different parties can supplement each other via collaboration. This paper will present respective designs and programs from the seven ITER party members.

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