

## § 1. Examination of the Integrated Liquid Blanket Module Tests Using Neutron-Generating Facilities

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A new collaboration activity was started, in which planning of integrated module tests for advanced liquid blanket in neutron irradiation environments were explored including establishing basic concepts, performing conceptual designing and enhancing basic research necessary for planning the tests. The first investigation was started for the case of ITER Test Blanket Module with Li/V blanket and Flibe blanket as a reference and alternative system, respectively.

The following critical issues necessary to be investigated were reviewed for the purpose of designing the Li/V blanket module system.

### 1. MHD pressure drop and structural analysis

The idea of structural designs mitigating the MHD pressure drop was discussed. Several structural designs were proposed for reducing the pressure drop which are complementary to the insulator coating development. Also discussed was the maintenance procedure.

### 2. Neutronics

Status and necessity of the nuclear data for neutronics analysis of tritium production and activation of the module were reviewed.

### 3. Tritium recovery

Tritium extraction technique from molten Li was discussed. Collection of tritium by Y getter was proposed as the recovery procedure. Basic experimental studies to verify this system were planned such as reduction of nitrogen level in Li to avoid nitrogen attack to Y and measurement of hydrogen absorption to Y in Li at high temperature.

### 4. Materials database

Available design data for V-4Cr-4Ti were reviewed and necessary information for structural design was summarized. Possible improvement in the design window by optimization of chemical composition and thermomechanical treatments was discussed. Also discussed was a potentiality of the present candidate materials for manufacturing the blanket components, such as shaping, joining and so on.

In addition, critical issues, necessary information and roadmap toward the module tests were overviewed for Flibe blanket.

For verification of the Flibe blanket system, suppression of corrosion of structural materials by controlling REDOX is the key issue. Suppression of tritium leakage in and out of the module is also necessary to be investigated.

Toward the collaboration in FY2003, grouping of the collaboration members was made into tasks of (1)thermal and structural analysis, (2)neutronics, (3)tritium recovery, (4) materials database, (4) conceptual design for Flibe blanket, and (5) concept integration. The collaboration activity will be continued in FY2003 and the summary report is expected at the end of FY2003.

The present activity should be closely linked to the international activity of planning and proposing the Blanket Module Tests in ITER. For this purpose cooperation with JAERI will be enhanced further.

Blanket performance tests were also planned in medium flux area of IFMIF. The share of the roles of ITER and IFMIF should be examined for the development of advanced liquid blanket systems.

The presentation and discussion record in the collaboration in FY2002 were summarized and published in reference [1].

## Reference

[1] "Examination of the integrated liquid blanket module tests using neutron-generating facilities" Presentation and Discussion records, February 2003, National Institute for Fusion Science, in Japanese.