

§9. Overall Evaluation of Plasma Facing Materials for LHD

Yoshida, N. (Kyushu Univ.), Noda, N.

In LHD, surface analyses of divertor tiles and wall test pieces are in progress. Deposition/erosion profiles of iron impurity on the carbon tiles well agree with expected ones obtained based on calculated magnetic field structures. Details are described in another section by Sagara et al. [1]. Several test pieces were exposed to conditioning and main discharges in LHD. The surfaces were analyzed in NIFS, Nagoya University and Hokkaido University, of which details are reported in other sections [2, 3]. These results were intensively discussed in a series of research meetings in this collaboration program.

Four programs were assigned as ITER collaboration. Subjects are 1) modeling of erosion/deposition processes, 2) hydrogen behavior in tungsten carbide layer, 3) hydrogen adsorption to carbon dusts, 4) optional first wall design without beryllium. Interim reports were discussed in the meetings of this program, and final reports have been submitted to ITER JCT.

Three research meetings were held in this fiscal year. A number of research activities are reported and discussed. They are not limited within direct collaboration programs for LHD at this moment, but basically important in future.

The first meeting was held on 8th and 9th in August at NIFS, combined with an other program titled as "Divertor Science" [4]. The number of the participants was around 40. In addition to LHD and ITER collaborations, recent results in fusion experimental devices such as JT-60U, Heliotron-J, GAMMA -10, high Z limiter experiments in TEXTOR were reported. Laboratory studies discussed were deuterium retention in SiC/SiC, divertor modeling/simulation, evaluation of tungsten materials, impact of negative ions upon sheath formation etc. A special presentation from an industry activity was studies on degradation of X-ray targets, which have close correlation of damages on the plasma facing wall in fusion devices.

The second meeting was held at Naka site of JAERI on

December 1st, which was participated around 30. The program was arranged with a bit emphasis upon the JAERI works. The reports from JAERI were relating to experiments on ferritic steel first wall in JFT-2M. The results are promising either from plasma performance or PWI points of view. A lot of ITER activities in JAERI were also reported on development of the divertor targets, heat load tests of Be-Cu joining mockups for the first wall, removal of tritium contamination by UV or laser beam, PSI studies with tritium ion beam etc. Another highlight was tritium measurement on carbon tiles of TEXTOR. Tritium atoms were generated through DD reaction and partially deposited on the tiles. Newly developed two methods were success fully applied, that is, beta-induced X-ray spectroscopy, and imaging plates.

The third meeting was held at Research Institute for Applied Mechanics in Kyushu University on February 15 and 16, 2001. Around 40 participated. Detail results on LHD divertor tiles were reported for the first time. Other topics reported are analyses for adhesion of boron films to carbon, simultaneous irradiation experiments of hydrogen and carbon beams, impacts of helium/deuterium irradiation upon hydrogen adsorption at surfaces of tungsten, SiC, measurement of negative ions in detached plasmas, chemical behavior of deuterium in SiC, hydrogen behavior in thin lithium layers, development of ductile tungsten alloy, evaluation of mechanical property of carbon divertor mockups for LHD, modeling of overall hydrogen particle balance etc. Some announcements were given on the new program of Japan-China collaboration, a plan of the 15th PSI conference in Gifu, PSI-network in Japan.

Many activities and ideas are discussed and exchanged in these meetings with the LHD program as one of the target, which enhances common understanding and problem definition, and stimulate activities further in the PSI research field.

References

- [1] A. Sagara, in this annualreport.
- [2] N. Inoue, in this annualreport.
- [3] T. Hino, in this annualreport.
- [4] T. Mizuuchi, in this annualreport.