中科院等离子体所研究员讲堂

特邀报告

报告名称：Overview of plasma materials interactions in JT-60U focusing to carbon erosion/deposition and retention of hydrogen isotopes (H, D and T)

主讲：Tetsuo Tanabe 教授

时间：2018 年 11 月 2 日上午 9:00

地点：8-1 3 楼会议室

授课内容摘要：

In JT-60U at QST (previously, JAERI), postmortem analysis of plasma facing surfaces (first wall and divertor tiles, collector probes and dust sampled) were done under joint research work with JAERI and Japanese universities, which was led by T. Tanabe, and the results have been contributed to PMI or fusion community in the world with more than one hundred papers. The work includes:

- Retention of hydrogen isotopes (H, D, T)
- Hydrogen recycling by spectroscopic measurements
- Impurity production, transport, accumulation, deposition
- Erosion/deposition of carbon tiles
- Dust collection and tritium measurement in vacuum vessel
- Tritium removal by discharge method
- Wall conditioning
- Performance of High Z materials as PFM
- Wall temperature effect on PMI

This lecture will focus on three subjects: retention of hydrogen isotopes (H, D, and T), erosion/deposition of carbon tiles, and dust collection and tritium measurement in vacuum vessel. The following conclusions are given:

(1) Using accumulated experimental data for hydrogen retention in relation with carbon erosion and deposition, a model for fuel retention build-up in full carbon machine of JT-60U has been derived.

(2) In early discharge time, retention in the bulk could occupy a significant part

of the total retention. But it would saturate soon and hardly increase to become minor.

(3) With increasing discharge time, retention in the eroded areas exceeds bulk retention but saturate a little later.

(4) Retention in the subsurface is very small but continues to grow.

(5) For prolonged operation, retention in the re-deposited layers becomes dominant in the total retention.

Based on these, my personal conclusion is that a full carbon reactor is possible, because higher tile temperature operation would significantly reduce T retention, with additional benefit of less T retention in bulk and easy isotope replacement of T retained near surface layers make recovering T easy compared to high Z plasma facing wall.

授课人介绍：

Tetsuo Tanabe，教授，中国科学院国际人才计划访问学者。长期在名古屋大学、九州大学等著名学府担任教授职务。曾任日本文部科学省科学技术·学術审议会委员、日本学术振兴会科研费委员会委员、国际氚会议(Tritium) 计划委员会主席、ISFNT大会计划委员会主席、PSI大会国际顾问委员会委员等职。目前已发表论文300余篇，会议学术报告200余篇，并出版了《Tritium》(Springer) 等专著。

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