

2. Collaborations on Fusion Engineering

(1) Fusion Engineering Studies

In the fusion engineering research field, 23 collaboration programs in total have been carried out. Subjects are relating to blanket technology, insulating materials, low activation structure materials, plasma-facing materials, neutronics analyses and measurements, superconducting materials and technology *etc.*

Six reports are given for the blanket technology and insulating materials.

- Fabrication of Erbium Oxide Coating by Sol-gel Method (Terai),
- Feasibility Study of Chemistry Control in LiPb dual coolant Concepts (Konishi),
- Tritium Control for FLiBe/V- alloy Blanket System (Muroga),
- Experimental Evaluation of Neutronics Properties of Liquid Blanket Systems Using DT Neutron Source (Iida),
- Development of multilayer wall channel to reduce MHD pressure drop (Hashizlme),
- Turbulent Heat Transfer for Heating of Water in a Short Vertical Tube (Hata).

Ten reports are relating to basic research and development of structure materials of blankets. Effects of neutron irradiation or ion impacts are discussed in some of these reports.

- Standardization of the fracture toughness test method by round bar with circumferential notch (Kasaba),
- Evaluation of bonding interface in advanced structure materials for fusion reactors (Satou),
- Development of Joint Technique of SiC/SiC Composites (Hinoki)
- Radiation Resistance and Mechanical Properties of Solution and Dispersion Hardened Vanadium Alloys with Fine Grains of High Purity Matrix (Kurishita)
- The Hardness Changes and Microstructure of Laser Welded V-4Cr-4Ti Alloy after Neutron Irradiation (Watanabe)

- Effects of Cold Working on Microstructural Development during Irradiation (Nita)
- Irradiation Creep Behavior of Vanadium alloys during FBR irradiation (Fukumoto),
- Lifetime investigation of reduced activation ferritic steels for steel-based blanket in fusion reactors (Kohyama),
- Effects of Ion Beam Irradiation on Electrical Insulating Performance of Er_2O_3 Coating (Shikama),
- Microstructure Observation and Deuterium Trapping Property in Ion Irradiated Ferritic Steel (Iwakiri).

Activities on key element technology of the International Fusion Material Irradiation Facility have been discussed in the framework of the NIFS collaboration and a Summary is given by H Matsui. The title of the report is “Summary of Key Element Technology Verification and Preparation for Engineering Validation of Intense Neutron Source”.

A theoretical work titled as “Multiscale Modeling of Radiation Damage Processes in Fusion Materials” is reported by Morishita.

Five reports are given for collaborations in superconducting magnet research. .

- Development of V-Ti and V-Ti-Ta Superconducting Alloy Conductors (Inoue),
- Fabrication of low activation MgB_2 mono-cored superconducting wire for fusion reactor (Kikuchi),
- Influence of cold-thermal and mechanical fatigues on AC losses in superconducting coil (Takao),
- Cryogenic Tensile Fatigue Strength of Composite Insulation Systems for Superconducting Magnets (Shindo),
- Property of Large-sized Cylindrical Super- conductor Composed with Ni Meshes for a Current Lead (Yoshizawa).

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