

# CRP and Meeting Objectives

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Second Research Coordination Meeting of IAEA Coordinated Research Project on  
*Plasma-Wall Interaction for Irradiated Tungsten and Tungsten Alloys in Fusion Devices*

Seoul National University, 8-11 September 2015



**IAEA**

International Atomic Energy Agency

# CRP on Irradiated Tungsten

**Full title:** Plasma-Wall Interaction for Irradiated Tungsten and Tungsten Alloys in Fusion Devices.

**But really...** Tritium Retention in Irradiated Tungsten.

**Main topics:**

- Characterization of microstructure of irradiated tungsten;
- Hydrogen trapping and migration in damaged tungsten.

**Main objective for the end of the CRP:** To provide best expert estimates and uncertainties for tritium retention in tungsten-based materials in a fusion reactor environment.

**Schedule:**

- First Research Coordination Meetings (RCM) **26-28 Nov 2013**.
- 2<sup>nd</sup> RCM at SNU, Korea, **8-11 Sep 2015**
- 3<sup>rd</sup> RCM in about **Q2 2017**.
- **Final report** developed in 2017, **published in 2018**.

**Other activities** are possible, e.g. in connection with PSI or PFMC meeting.

# CRP Research Objectives

**Broad objective:** to understand how tritium retention, tritium migration and ways to extract trapped tritium are affected by radiation damage.

- Effects of neutron irradiation and charged particle surrogate irradiation on the microstructure of tungsten-based plasma-facing materials.
- Relation between tungsten microstructure after irradiation and properties of tritium retention and tritium migration.

**Goal for the end of the CRP:** Synthesize new information, extrapolate to relevant fusion neutron fluence, and provide best expert estimates and uncertainties for properties of tritium retention and tritium transport for tungsten-based materials in a fusion reactor environment.

**Central concept:** Irradiated tungsten microstructure.

- How to characterize microstructure (in experiment and in a database)?
- Study production and evolution of vacancies, interstitials, Frenkel pairs, line and plane dislocations, bubbles, grain boundaries, amorphization, ..., as a function of mode of irradiation.
- How does tritium trapping and tritium migration depend on microstructure?

**The CRP requires strong coupling between experiment and computation.**



# Objectives for the Second RCM

Exchange information about ongoing work; review work that is most needed next 2-3 years.

- Experiments and modelling to improve understanding of damage production; neutron and surrogate irradiation.
- Experiments and modelling to improve understanding of hydrogen in damaged tungsten, as it depends on the microstructure.
- Fundamental (QM) modelling to support applied (MD, KMC) work.

Review and coordinate work plans.

- Each participant to review work plan for next 2 years in light of all the work in the CRP.
- Make plans for cooperation; exchange of information between RCM.

Review goals of CRP

# Meeting schedule

**Tue + Wed + Thu am:** Presentations including discussion.

**Thu pm + Fri:** Review and discussion sessions.

1. Fundamental modelling and its connection to experiments and applied modelling.
2. Production and characterization of damage; experiments and supporting modelling.
3. Hydrogen (tritium) retention and transport in damaged tungsten; experiments and supporting modelling.
4. Review of expected outputs of the CRP and of individual contributions; plans for coordinated work.

**Following the meeting:** Production of the meeting report, INDC(NDS) series.

Presentation summaries are requested from all participants. I will ask for volunteer help for the summaries of Items 1-3 in the discussion.

**Presentations will be on the Web unless we are told otherwise.**