



UKAEA activities in 2022: TDS, microscopy and nanoindentation analysis of JET PFCs – plans and capabilities

Y. Zayachuk, A. Widdowson, I. Jecu, R. Kerr, P. Coad, J. Likonen



**UK Atomic
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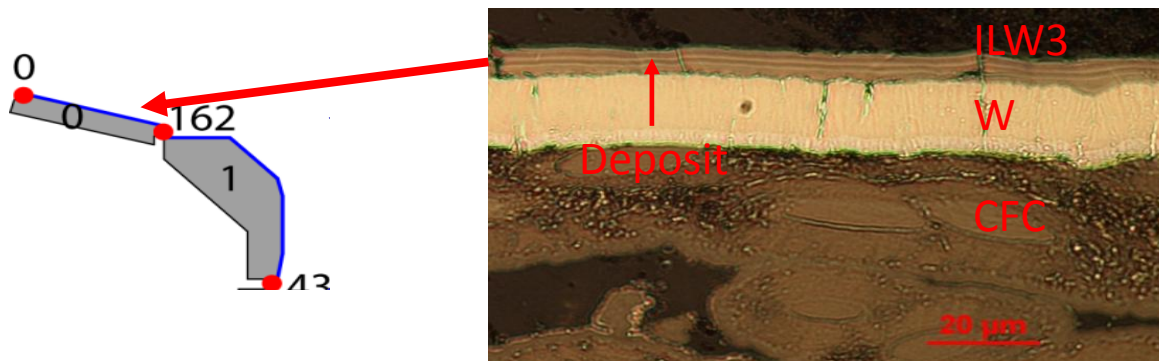
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Plans and capabilities



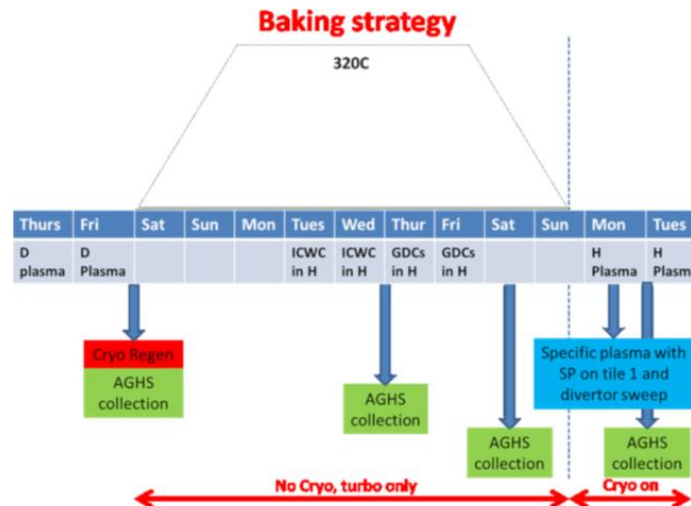
- TDS – combined with IBA in collaboration.
 - QMS-based, heating plate heater.
 - Be/T capable.
- Recrystallization studies – microstructure and micromechanics.
 - Materials Research Facility (MRF).
 - Be/T capable equipment.
 - Possibility of sample preparation for microscopy.
 - SEM+EDX/EDSD.
 - FIB.
 - Nanoindenter.
 - TEM (at University of Oxford).
- Passive diagnostics deposit chemical analysis – Raman spectroscopy.
 - MRF.

- Long-exposure samples:
→ From tiles 0 and 1 exposed over an extended period (ILW1-ILW3) and compare with single campaign results.



- TDS – retention measurements (collaboration with VTT).
- IBA at IST – before and after TDS.

- Simulation of baking cycle in laboratory experiments in order to independently assess the removal capabilities.



- Extended hold at 320°C in the TDS chamber → monitoring D release.
- Followed by further T ramp to 1000°C → remaining D content.
- IBA at IST – before and after TDS.



- Recrystallization of tungsten
 - Tile 5 stack B lamella samples, ILW2 and ILW3 (above recrystallization T)
 - MRF facility at UKAEA.
 - Sample preparation – cutting and polishing.
 - Microstructural study: SEM, EBSD.
 - Micromechanical study: nanoindentation.
 - Possibly IBA – microbeam analysis? (e.g., IST, or elsewhere).

Microstructure and micromechanics



- Recrystallization of tungsten:

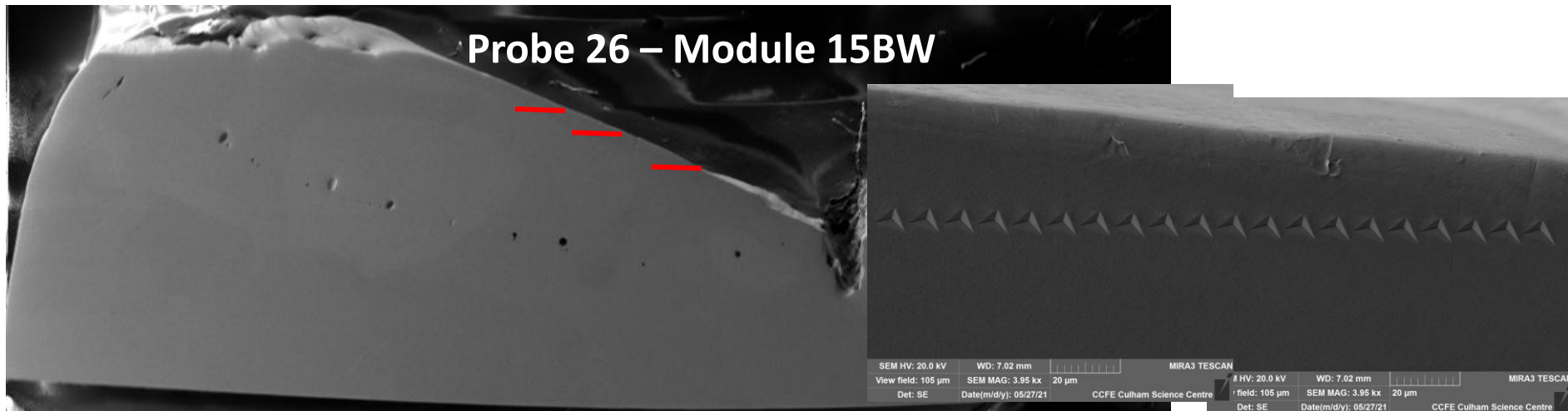
→ Langmuir probes.

→ SEM + EBSD.

→ Nanoindentation.

→ IBA at IST – microbeam analysis → correlation between nano-hardness and D content.

Probe 26 – Module 15BW



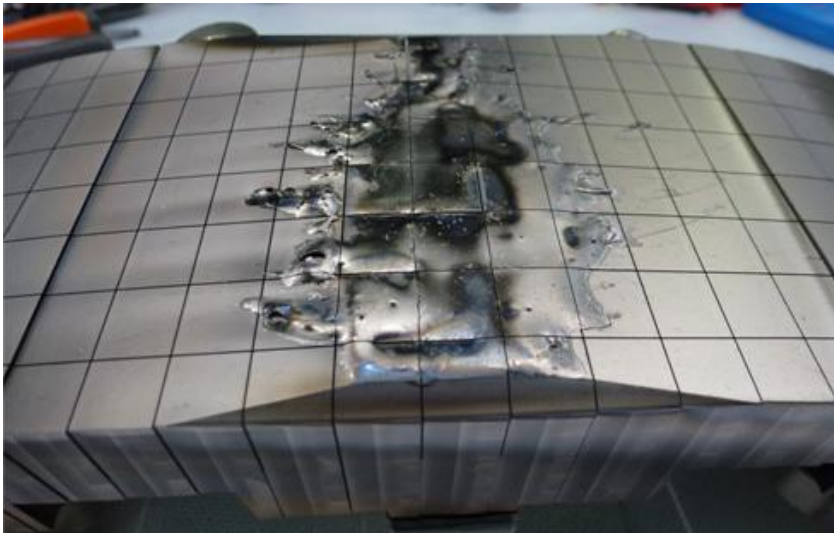


- Tile 0 and 1 surface deposits:
 - Cores and cross-sections for microscopy.
 - Long exposure (3 campaigns) vs individual campaigns.
 - SEM + EDX.
 - Liftouts – TEM (?)

Runaway electron damage



- Runaway electron damage:
 - 1XR18 C3 (2010-16) tile.
 - Cutting at IAP – coordination and high-res microscopy (I. Jecu).
 - Possibility of SEM-EBSD at MRF.



Passive diagnostics



- Louvre clips, QMB covers.
 - Possibility of Raman spectroscopy.
 - Available at MRF.
- Usability to be discussed:
 - What are chemical compounds of interest – are they Raman-active?

Tritium analysis



- Tritium analysis laboratory (TAL) @ UKAEA.
- Total combustion.
- Potentially tritium quantification – comparison with dissolution (UoL).