Microstructure and micro-mechanics characterisation of W and W alloys

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Activity 5: Plasticity, Materials Science and Modelling
Task: Microstructure and micro-mechanics characterisation of W and W alloys
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Objectives for Work Programme 2010

- Investigation of the fracture behavior of W and W alloys on the microscopic scale.
- Fracture mechanical test are conducted on notched microbeams using a nanoindentor:
Specimen preparation

- Usually, specimens for micromechanical tests are produced by using focused ion beam machining.
- Drawbacks: Time and cost intensive, limited specimen sizes

- Development of an effective and convenient pre-preparation method for such microbeams based on Micro-electric discharge machining:

![Diagram of polished surface](image)

Specimen preparation

- Method was successfully applied for the production of single- and polycrystalline tungsten microbeams of various sizes.

[Images of microbeams]

Example:
20 μm x 20 μm x 120 μm

- Multiple specimens can be produced in one preparation step
- Heat-damaged layer (1-3 μm) can be easily removed in a final preparation step by means of FIB
Main Conclusion of the Work Done

- Development of a new method for the specimen preparation by combining μ-EDM and FIB
- Preparation of single- and polycrystalline W microbeams

Work planned for the next period

- Micro-fracture experiments on W specimens using nanoindentation
- Fractured specimens will be investigated by SEM and electron backscattering diffraction to gain insight into the responsible failure mechanisms
- Development of a new specimen holder for heating or cooling the specimens