Ion beam polishing for sample preparation and scanning electron microscopy characterisation of copper

A notable characteristic of metals is the change in properties within their microstructure brought about by mechanical processing or heat treatment. Crucial to this is the composition of the microstructure in terms of alloying elements, their size, shape, orientation, various phases, their distribution and much more. Consequently, the microstructure is the basis of all material properties and determines, amongst other things, the deformation behaviour, which can ultimately have a significant influence on the component used in service. Precise characterisation of the microstructure is therefore essential to better understand the mechanisms occurring within the material during the deformation process, as well as potential damage processes during subsequent use.
In the first part of the investigation, various mechanical methods are used to produce cross-sections of a defined width. Methods for reducing the layer thickness are also required for the subsequent ion beam polishing. The aim is to develop a reproducible preparation procedure that enables defined and comparable sample preparation. The specimens produced are then validated using various microscopic analysis techniques. The electrochemical and mechanical sample polishing facilities already available at the WWHK, as well as other analytical methods, are utilised for this purpose.
In a further part of the work, the prepared specimens are to be processed using ion beam polishing to achieve a surface suitable for subsequent scanning electron microscopy investigations. Particular emphasis is placed on the independent selection of suitable boundary conditions and process parameters for ion beam polishing.
The aim here is to document the initial condition of the samples and, building on this, to define the best possible procedure.
The results of the various preparation methods are to be compared and evaluated. The resulting sample conditions are to be examined and evaluated using digital microscopy, confocal and laser scanning microscopy, and scanning electron microscopy. The investigative methods employed are then to be presented in the form of a report.

Prerequisites:

- An interest in materials science and

Type of placement:

- **Practical study phase (15 ECTS) at the WWHK**
- **Research and development module (10 or 20 ECTS) at the WWHK**

Duration and extent depend on the study regulations and the nature of the student's work

Start date: immediately

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