Involvement in committees and working groups

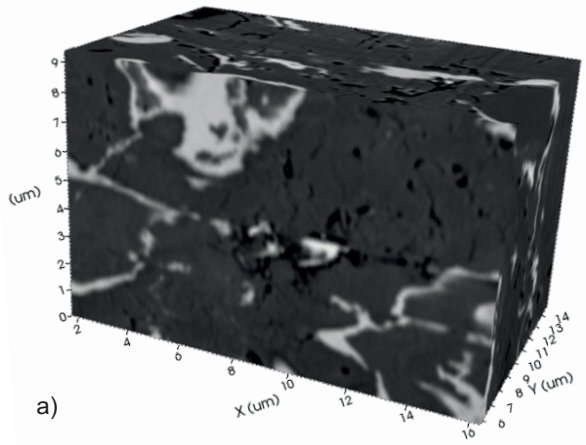
- VDEh committee for electron microscopy
- VGB material committee for materials and quality assurance
- DGM committee for scanning electron microscopy
- Committees as part of the working group for heat resisting steels and high temperature materials (AGW)

Special Equipment

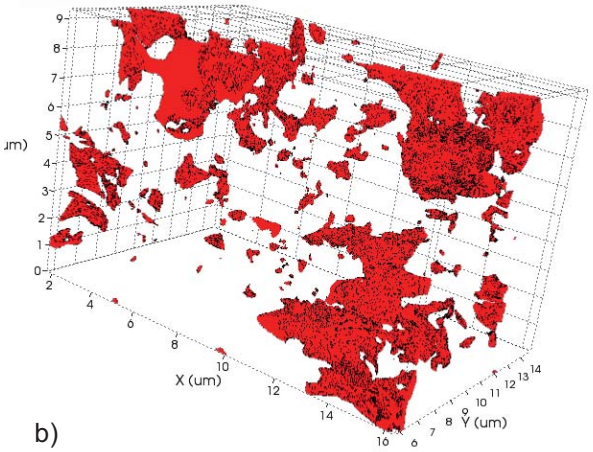
- Metallography, light microscopy, preparation applications among others: Saphir Vibro (vibration-polishing-device), Lectro-Pol5 (fully automated electrolytical polishing-and etching device), fully automated hardness testing device KB10 with a scope of testing of HV 0,025-HV 10
- Optical emission spectroscop (OES) to determine the composition of steels and aluminium alloys (spectral analysis)
- Energy-dispersive X-ray analysis EDX (on SEM and TEM)
- Scanning electron microscope JEOL JSM 6400
- Zeiss Auriga Crossbeam electron microscope with EBSD System, Focus Ion Beam (FIB) column, Lift-out technique, STEM, energy dispersive X-ray-micro analysis EDX
- System for digital image recording, filing, and documentation (Imagic)
- Transmission electron microscope Jeol JEM 2010F

Unit:
Electron Microscopy and Metallography

https://www.mpa.uni-stuttgart.de/en/institute/departments/ndt-and-materials-characterization/



a)



b)

3D imaging of selected phases in a layer for high-temperature fuel cells – deposited by thermal spraying (vacuum plasma spraying VPS)

a) complete image b) phase image TiO_2

Contact

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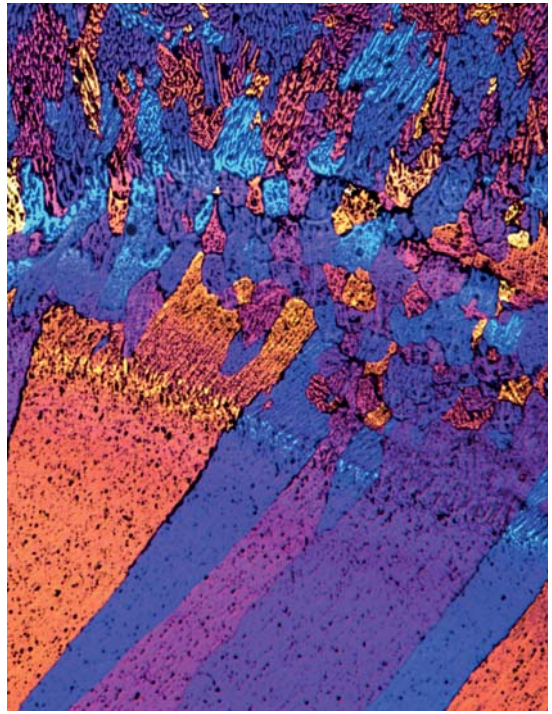
MPA STUTTGART
Materials Testing Institute
University of Stuttgart

Department
Non-destructive Testing and Material Characterization

Unit
- Electron Microscopy and Metallography



University of Stuttgart
Germany

Examining microstructures and their connection with material- or component characteristics as well as damage-and failure mechanisms of technical components are a key task at the Testing Institute at the University of Stuttgart and are therefore part of the academic activities of the department of electron microscopy and metallography. To accomplish this, equipment to characterize and study materials down to a nm-scale in the areas of mechanical engineering, power plant and plant engineering, the chemical industry, aerospace, and traffic engineering is provided.

Research /development

- Studies and qualitative/ quantitative descriptions of thermal or stress-related changes in the microstructure and on the surfaces (corrosion and oxidation) of metallic materials or compound materials as well as component behaviour
- Investigation and description of damage mechanisms in components applying metallographic methods, for example creep cavities development under the light-microscope, precipitation development in SEM and TEM

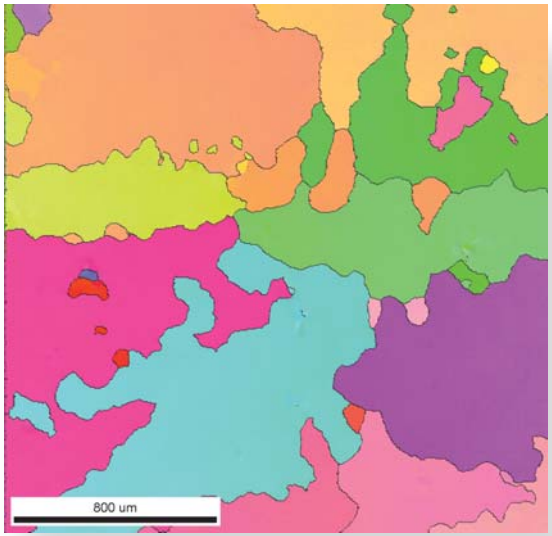
AURIGA™ CrossBeam® Workstation:
Field emission SEM with ion column and EBSD system makes up-to-date imaging, analysis and TEM target preparation possible

- Correlation between material behaviour (monotonous, periodical and static loading) and microstructure characteristics as well as the chemical composition
- New preparation techniques for studies with the light-microscope, SEM and TEM, which are adjusted for damage mechanisms and materials
- Analysis of structural composition of metallic materials

FIB preparation of a dissimilar weld (high temperature steel and nickel base alloy)

Research/ analysis/ evaluations/ testing

- Examination of structures using light and scanning electron microscopy to characterize material conditions and material flaws in metallic and non-metallic materials, including quantitative evaluation with automated image analysis techniques



EBSD grain orientation map depicting a nickel casting alloy

- Hardness testing
- Determination of the chemical composition of steels and aluminium alloys (“spectral analysis”)
- Surface imaging as well as examination of fractured surfaces, cracks and defects under the scanning electron microscope
- Transmission electron microscopy for high-resolution microstructural imaging, crystallographic phase analyses und determination of chemical compositions even on a nanometer scale
- Determination of equilibrium phase diagrams as well as precipitation processes via thermodynamic simulation (software packages Thermo-Calc, Dictra, and TC-PRISMA)
- Examination and evaluation of oxidation-and corrosion behaviour as well as protective layers
- Assisting companies with questions regarding metallurgical evaluation of materials as well as selecting materials for facilities and components