Multiscale analyses

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<th>cm</th>
<th>ViP</th>
<th>Virtual Petrography</th>
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<td>mm</td>
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<td>Micro Computed Tomography</td>
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<td>BIB-SEM</td>
<td>Broad Ion Beam milling &amp; Scanning Electron Microscopy</td>
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<td>nm</td>
<td>LMI-BIB-SEM</td>
<td>Liquid Metal Injection - BIB-SEM</td>
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Our state-of-the-art facilities enable material analysis and advanced image processing at gigapixel resolution. Using various data sources, MaP’s multiscale and multimodal data integration enables analysis of materials from centimeter down to nanometer scale. This enables fast, exact segmentation and determination of features such as pore shape and size, pore connectivity, phase distribution, microscopic contact angles, and more, providing high-quality insight into the microstructure of each sample.

Software

MaPro is an automated, multiscale, and multimodal image segmentation and analysis software specially for nanometer to centimeter-scale features. It enables customers to achieve results quickly after modest training, saving hundreds of hours over manual processing of the same data. Initially developed for characterizing heterogeneous rocks, it is used on a wide array of materials, including research in life science and materials science.

Consulting

MaP offers consulting on material science and characterization projects, with extensive industry experience especially in oil- and gas exploration and subsurface storage applications. A combined 30 years of projects make MaP a trusted partner for challenging microstructural analysis projects. MaP also offers to set up or improve in-house microstructural labs, from requirements gathering through vendor selection to training.

About MaP - Microstructure and Pores GmbH

We understand our customers’ goals and support them on the way to success! Working across industries and with many preparation and imaging technologies, from established to cutting-edge, we know how to extract the insights you need. Our researchers have over thirty years of experience in their fields, making our lab one-of-a-kind in the world. We are ready to work with our partners to reach your objective across industries and fields of science.

Materials

- Shale
- Batteries
- Ceramics
- Biofilms
- Mudstone
- Coatings
- Water
- Fibers
- Carbonate
- Bentonite
- Soil
- Tissue
- Sandstone
- Wood
- Oil
- Bone
- Salt
- Glass
- Lipids
- Tooth
- Granite
- Polymers
- Paint
- Blood
- Cement
- Food
- Bacteria
- Implants
- Plaster
- Organic mat.
- Capillaries

Contact us

If you are interested in what MaP can deliver to help your development, research or production process, or you are looking for support in unleashing the full capabilities of your own lab, contact us today!

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µ-CT  Micro Computed Tomography
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LMI-BIB-SEM Liquid Metal Injection - BIB-SEM
Cryo-BIB-SEM Cryogenic Ion milling & Cryo-SEM
FIB-SEM Focused Ion Beam milling & SEM
TEM  Transmission Electron Microscopy

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  Cryo-BIB-SEM
  Microanalytics

- Dr. Jop Klaver
  Microstructures of tight rocks
  BIB-SEM
  Metal Injection methods

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Limestone, BIB-SEM
Cement, Cryo-BIB-SEM
Wood, LMI-BIB-SEM

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7 µm
20 µm
60 µm

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Microstructural pore space analysis

For high-resolution microstructural analysis at representative scale of heterogeneous materials, such as rock samples, MaP uses Broad Ion Beam (BIB) milling with Scanning Electron Microscopy (SEM) imaging. The ion-milled surface enables Gigapixel image mapping at nano-scale resolution of undamaged microstructures followed by image processing and statistical analysis of pore and grain geometries and its chemical compositions.

Petroscan Tileviewer

Automated petrography

Virtual optical microscopy (ViP) displays acquired mosaic images of thin-sections with 10 nm accuracy at all settings of a conventional polarizing microscope. Studies can combine ViP with BIB-SEM, allowing offline and remote assessment of annotations. This enables a new way of collaborating and the sharing of expertise. In multi-scale automated petrographic analyses MaP can reliably segment fracture networks, minerals, pores and mineral overgrowths.

MaPro (BIB-SEM)

Pore connectivity analysis

Our Liquid Metal Injection (LMI)-BIB-SEM method measures 3D pore connectivity and percolation threshold for porosity and permeability assessments. LMI complements Hg-Porosimetry (MIP), providing intrusion data but additionally visualizing the actual intruded pore space. True porosity can be distinguished from artifacts, correcting e.g. for core damage. It can be applied on porous material with sub-micrometer pore throats for analyses.

MaPro (Cryo-BIB-SEM & contact angles)

Pore fluid analysis

Our unique cutting-edge Cryo-BIB-SEM method allows the imaging and investigation of cryogenically stabilized pore-fluids and measuring via a FluidMap the direct in-situ fluid chemistry, wettability, fluid distribution and -saturation. This methodology opens new fields of research such as EOR screening or core and formation damage evaluation on fresh samples, such as cuttings and enables studying sensitive materials such as soils down to the nm-scale.

Soft matter analysis

Combining Cryo-Broad Ion Beam sputtering with Cryo-SEM and chemical analysis using EDS we image and analyze cryo-preserved fluids inside pore networks and micro cracks. Cryo-loading and a Cryo-saw allow sample preparation under LN2 conditions enabling investigation of wet, heterogeneous geological materials such as clays and reservoir rocks, sensitive and soft materials such as tissue, polymers and medical/biological preparations.