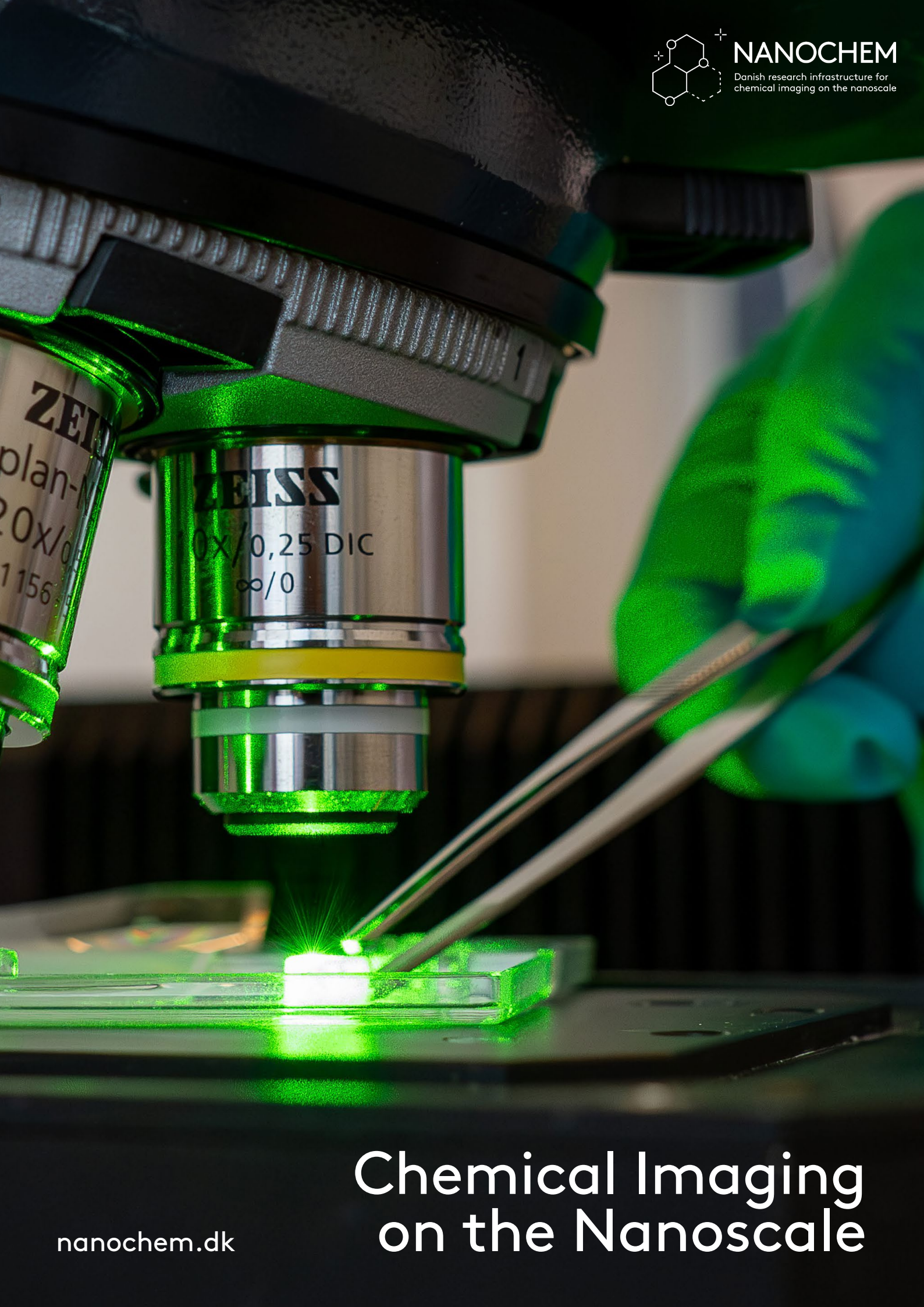
NANOCHEM
Danish research infrastructure for
chemical imaging on the nanoscale
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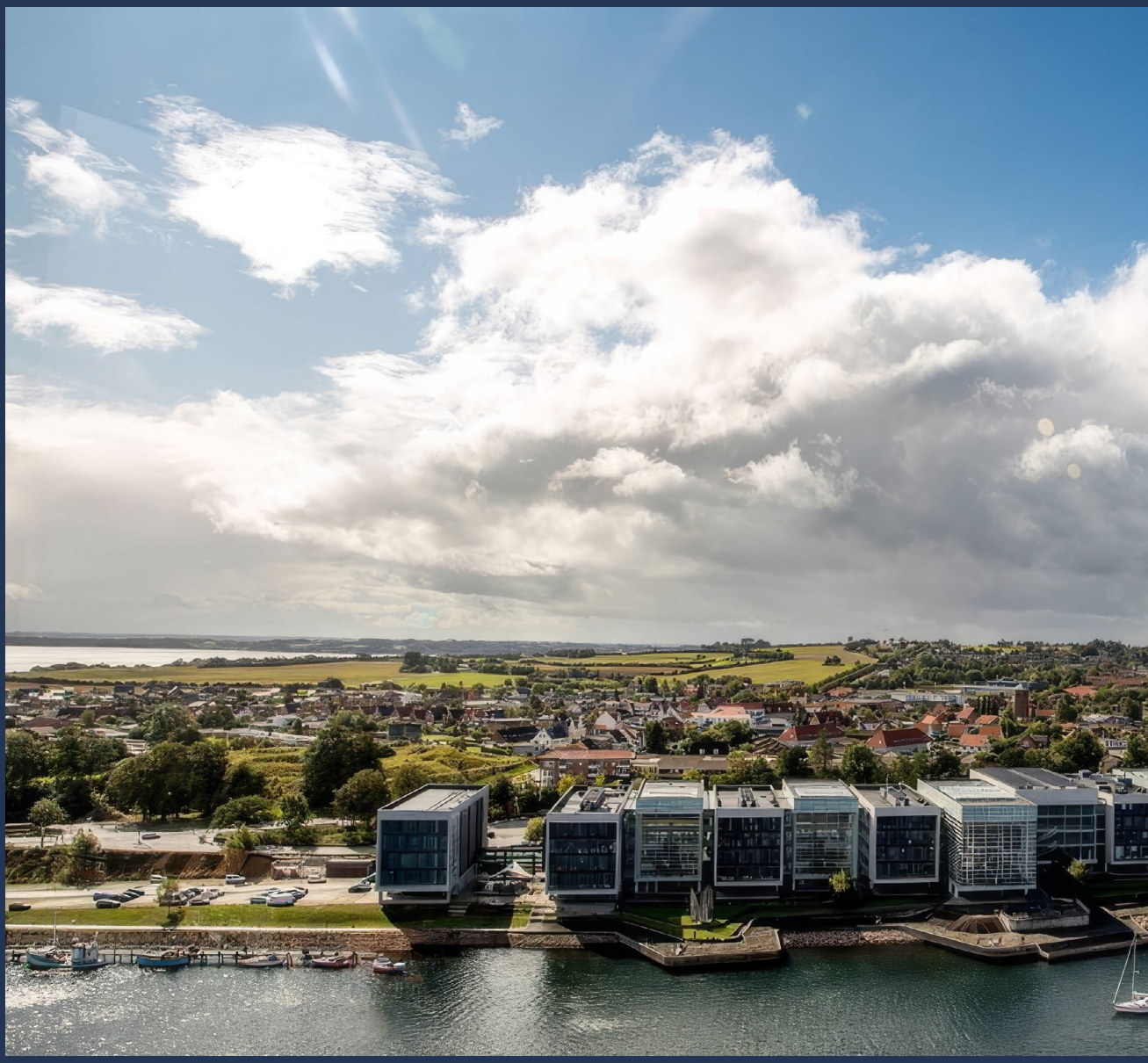
Chemical Imaging
on the Nanoscale
nanochem.dk

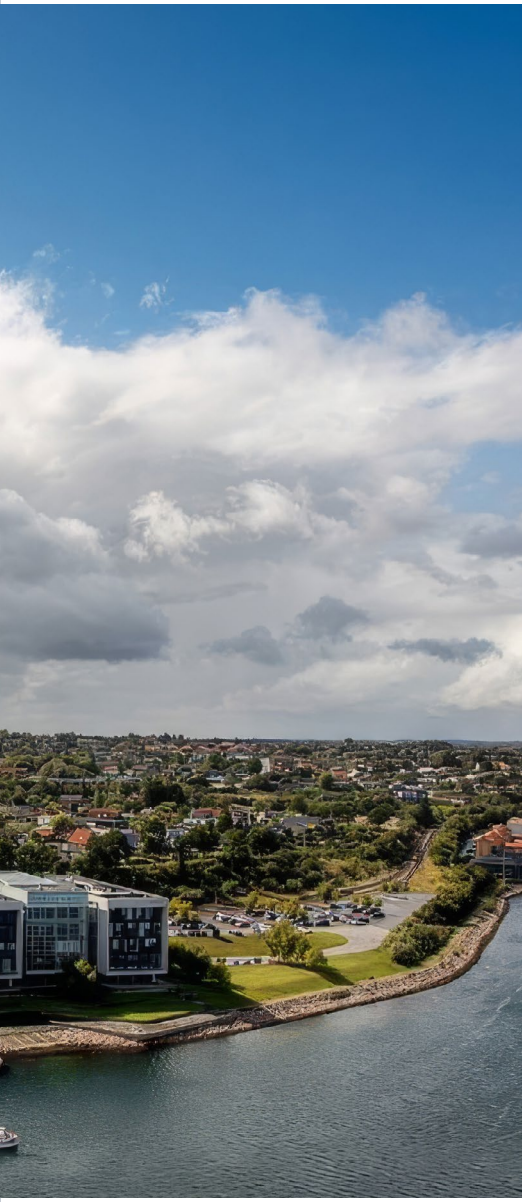


Welcome to NANOCHEM

NANOCHEM has a unique position in the Research and Development of Denmark. It is the national infrastructure for chemical imaging on the nanoscale.

Our mission at NANOCHEM
We combine optical and non-optical imaging on the nanoscale towards a unique nanoscale chemical imaging facility

Our goal is to understand function and failure of advanced technical or biological entities. This requires complete imaging characterization, not only of structure and dynamics, but also of chemical composition. A multitude of innovative multimodal imaging techniques enhance the spatial resolution to nanometers or better and facilitate the correlation of relevant physical properties.



Innovative solutions for the future of materials

NANOCHEM is vital for R&D of new materials

Novel materials with superior strength, durability, and lightweight properties need advanced characterization techniques. We provide support and guidance throughout the whole process, from idea to product, sharing both our expertise and our advanced measurement and fabrication tools.

What is so special about NANOCHEM?

Complete characterization requires information on the surface and bulk chemical components, but also on other features such as particle size, distance, and homogeneity in three-dimensional space. NANOCHEM offers new multi-modal imaging approaches combining high-spatial resolution and chemical sensitivity to achieve complete analysis of materials and devices.

Sectors

- → **Materials Science:** Studying the microstructure of materials.
- → **Biology:** Imaging biological specimens at high resolution.
- → **Nanotechnology:** Fabricating and analyzing nanoscale devices.
- → **Semiconductor Industry:** Inspecting and characterizing semiconductor devices.

- → Developing strong, durable, and lightweight materials
- → Developing biodegradable plastics and sustainable packaging
- → Finding cost-effective material alternatives
- → Advancing 3D printing for rapid prototyping and customization
- → Creating longer-lasting, high-performance products
- → Ensuring quality in recycled materials for the circular economy.
- → Enhancing energy-efficient manufacturing processes.
- → Supporting green transformation with new materials and production methods.

SEE OUR PRESENTATION FILM HERE:

Optical Nanoscopy

Optical nanoscopy and spectroscopy utilize the interaction of light with matter to monitor the properties, composition, and structure of materials and fabrication processes. Optical techniques allow non-invasive and non-destructive analysis of delicate samples like polymers, biological tissues, and nanomaterials.

Our techniques:

Confocal Raman imaging spectroscopy measures vibrational modes of molecules to identify chemical bonds and crystallinity.

Stimulated Raman spectroscopy offers faster acquisition speeds, higher sensitivity, and reduced fluorescence background compared to traditional Raman spectroscopy.

Nanoscale Fourier-transform infrared spectroscopy combines infrared spectroscopy with atomic force microscopy and enables the study of chemical composition and material properties of surfaces.

Sum-frequency generation spectroscopy is an advanced optical technique that probes surface bound molecular vibrations, making it ideal for studying molecular orientation, structure, and chemical composition at interfaces such as solid-liquid, solid-gas, and liquid-liquid boundaries.

COMBINING THE TECHNIQUES PROVIDES:

- → Multiscale imaging from different fields of views and spatial resolution.
- → Complementary information of chemical mapping and simultaneous/ subsequent information on topography, morphology, and composition.
- → Enhanced contrast for complex composite materials and samples.

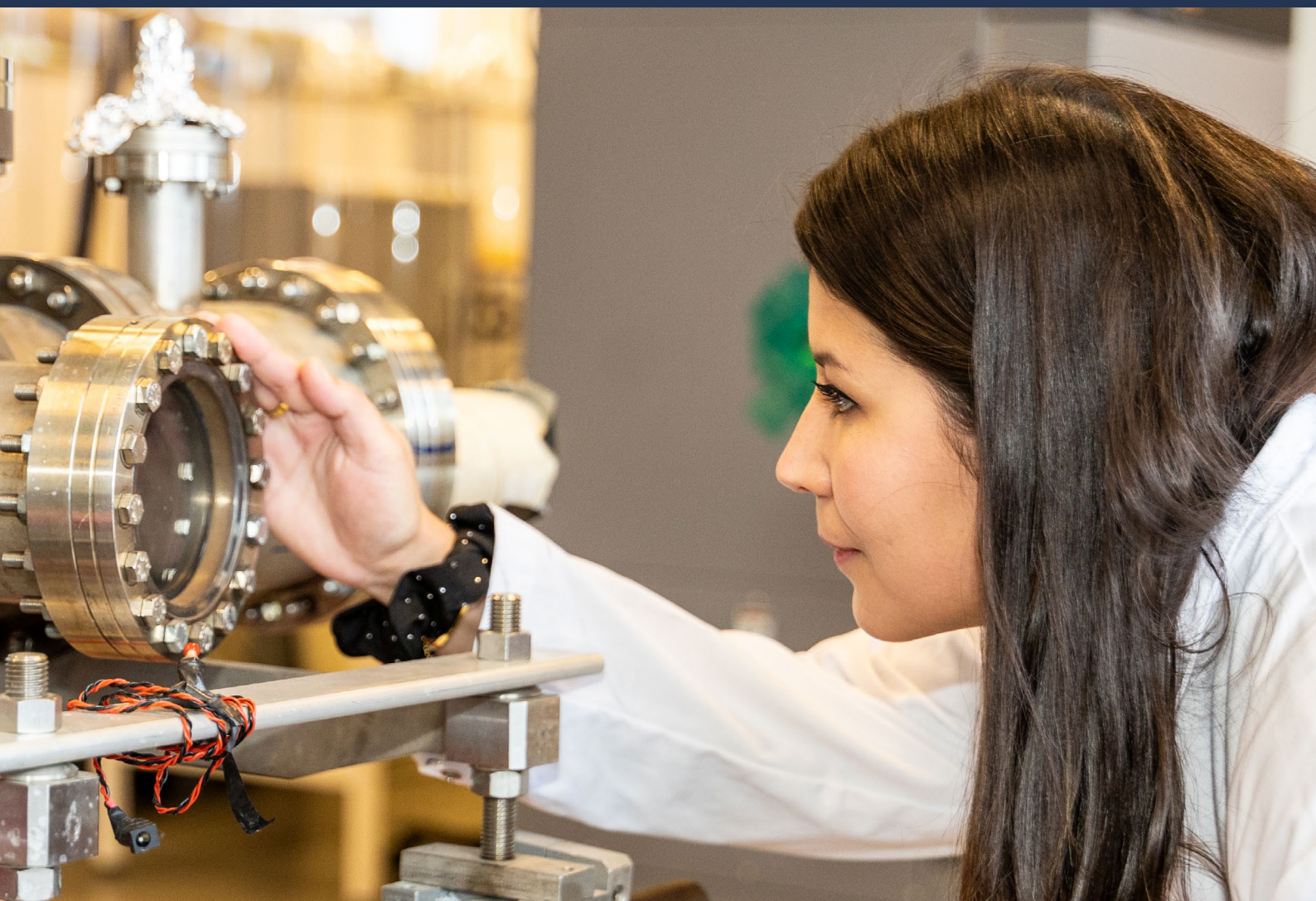
Charged Particle Nanoscopy

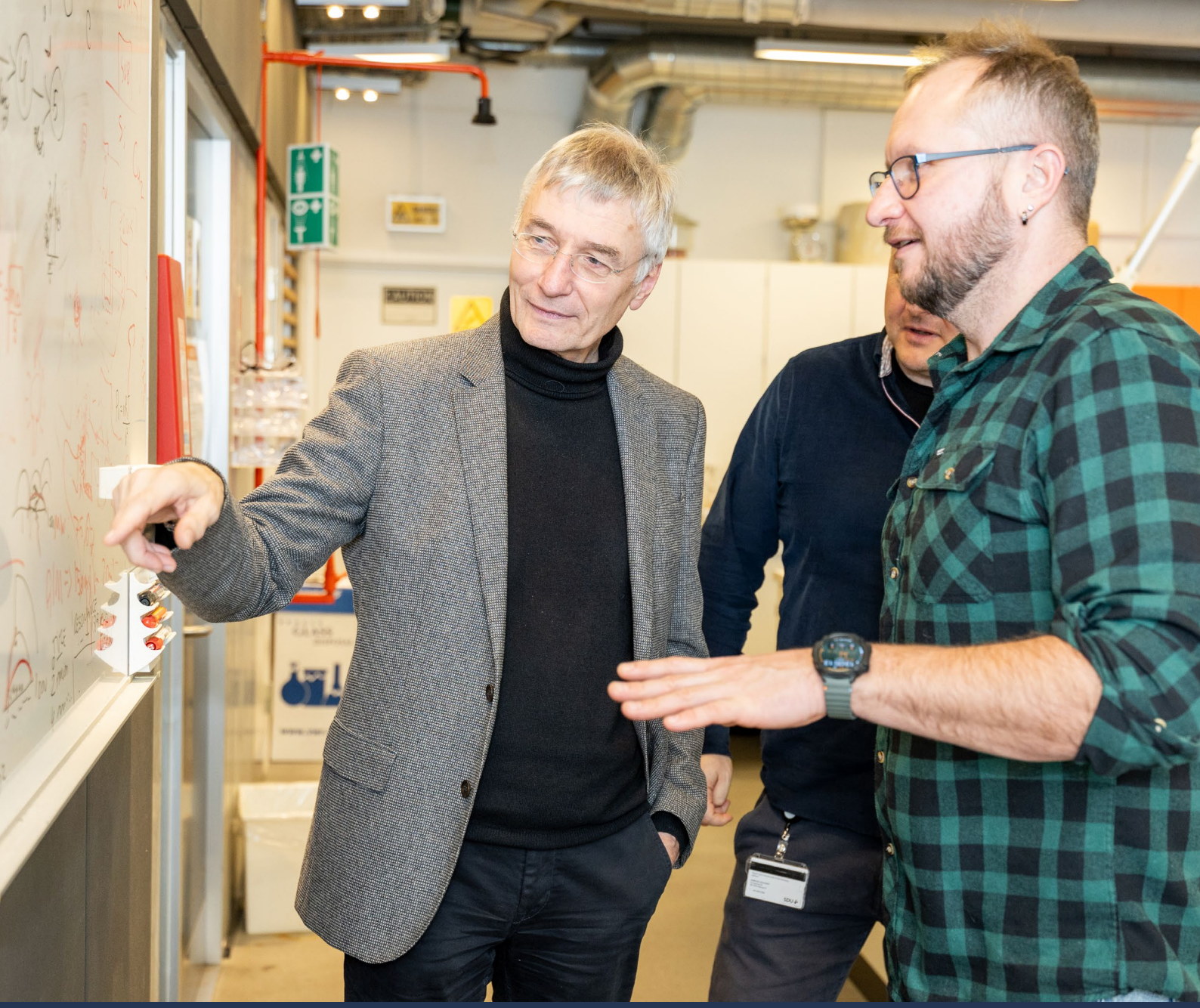
Charged particle microscopy/nanoscopy is a technique that uses charged particles, such as electrons or ions, to achieve high-resolution imaging and analysis of materials. The key advantage is its ability to provide detailed images and information about structure, composition, and properties of materials at very small scales, often down to the atomic level. The key advantage is its ability to provide detailed images and information about the structure, composition, and properties of materials at very small scales, often down to the atomic level.

Focused-ion beam imaging with secondary ion-mass spectroscopy offers nano-chemical imaging with focused ion beams (FIB) for visualization, depth-profiling and quantification of spatial distributions of chemical elements and compounds at the nanometer length scale.

Transmission electron microscopy with electron energy-loss spectroscopy is a reliable tool, providing information about elemental composition and the structure down to atomic-level resolution, enabling precise mapping of a material.

Helium ion microscopy is an advanced instrument for ultra-high-resolution imaging and nanofabrication. It exploits focused helium, neon and gallium ion beams for both image generation and nanostructuring.





Find out more:

Our Workflow

When requesting an analysis at NANOCHEM, this workflow will create the most satisfying output.

Send an email to info@nanochem.dk with a brief description of the task.

Guidance and Consultancy

After contacting us, the user support team will request additional information about the problem to be solved, the materials and devices, and the required data and solutions. Through dialogue, both the appropiate methods within the NANOCHEM network and affiliated partners, as well as the time frame for the investigations will be discussed.

Sample preparation

Samples must be prepared to match the requirements of the selected methods. Every method has specific requirements regarding size and shape, the state (liquid, solid) and possibly the sample transport. Samples can be prepared both at the customer and NANOCHEM sites.

Investigations and Reporting

After the measurements, a report with experimental details will be provided. If possible and upon request, an initial interpretation of the results as well as the raw data will be provided.

Partner Facilities

The facilities are placed at three universities: SDU, AAU, DTU

C:MAC/NANOSYD, SDU

The Centre for Materials Analysis and Characterization (C:MAC) at the Mads Clausen Institute, SDU Sønderborg, offers advanced materials analysis and characterization. Specializing among others in sensor technology, nanophotonics, organic photovoltaics, semiconductor devices, microfluidics, smart materials, and thin films, C:MAC supports both industry and academia. C:MAC's expertise drives innovation across sectors like electronics, medical, and renewable energy.

Nanolab / Cleanroom, AAU

The AAU Cleanroom/Nanolab at Aalborg University, part of the Department of Materials and Production, promotes micro- and nanotechnology research and development. Equipped for fabricating electronic devices from micrometer to nanometer scales, the facility supports both academic and industrial projects. Services include access to advanced equipment, expert consultancy, and collaborative opportunities.

DaMBIC, SDU

The Danish Molecular Biomedical Imaging Center (DaMBIC) at the University of Southern Denmark offers state-of-the-art bioimaging infrastructure and services. Specializing in advanced light microscopy, DaMBIC supports research across health sciences, engineering, and natural sciences. The expertise of DaMBIC facilitates high-level research and innovation for both academic and industrial partners.

Nanolab, DTU

DTU Nanolab, the National Centre for Nanofabrication and Characterization in Denmark, is located at the Technical University of Denmark (DTU). This open-access facility offers state-of-the-art infrastructure for micro- and nanofabrication and electron beam-based characterization. DTU Nanolab supports both academic and industrial research, driving innovation across various sectors through advanced processing equipment and expertise.

SDU

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SEE OUR PRESENTATION FILM HERE:

´As a shared conservation center working for more than 30 museums on preservation and research into their collections, collaborating with NANOCHEM is a transformative experience. The shared infrastructure enhances our experimental capabilities and fosters an environment of innovation and exchange of ideas. The seamless integration of state-of-the-art technology – fi. multispectral-, 3D- and nanoscale chemical imaging with our work has significantly raised our potential and allowed us to explore new frontiers in our field. This partnership exemplifies how collaboration can drive scientific breakthroughs and deepen our understanding of complex materials.´

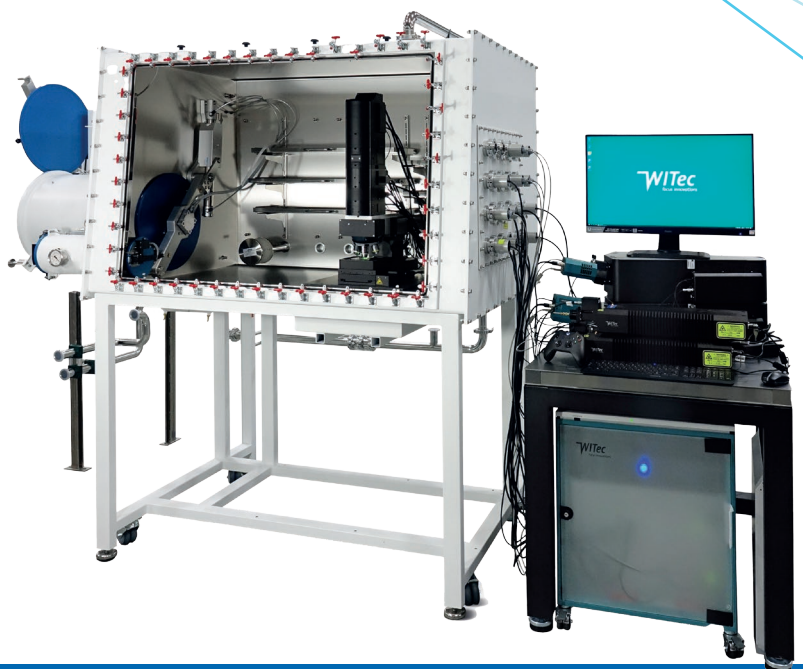
Lise Ræder Knudsen, Director
Conservation Center Vejle, DK

Providing high-technology, laser and light based measurement solutions

KIMMY

We have almost 40 years´ of experience in providing high-technology, laser and light-based measurement solutions and components to researchers, engineers and other professional end-users. We offer our knowledge and commitment to benefit you in your own developments and designs.

By combining the best technology and engineering talent our partners and suppliers can provide, we are able to find the perfect solution for your applications.



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