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WROCLAW, POLAND

CATALOGUE OF THE R&D LABORATORY 2022

LABORATORY SERVICES
FOR RESEARCHERS AND
INDUSTRY

the state-of-the-art independent
**LABORATORY OF
NANOTECHNOLOGY**
in Poland



about our work



The Nanores Lab's staff is a team of engineers and scientists from various scientific fields who can be entrusted with research services, creating breakthrough solutions or seeking answers to pressing questions.

- Aneta Zięba,
scientific director
of the laboratory

mission

We are a modern, independent research and development laboratory focused on providing the highest quality services and raising the standards of cooperation between science and business.



qualified staff
of engineers and
scientists



state-of-the-art equipment
of nanotechnology laboratory



individual
approach



rapid order
processing time



highest quality
of analyses

applications - what do we research and manufacture?

Testing of the properties and structure of materials

Scanning electron microscopy (SEM) is an excellent technology that allows imaging the sample surface at a micro- and nanometric scale, achieving the magnification of up to 1,000,000 times and visualizing its topography or structure. Observations made with a number of specialist detectors provide a comprehensive set of information, e.g. distribution of elements obtained by EDS/EDX microanalysis of chemical composition. Moreover, the microscopes used in the research are built in a dual beam microscope configuration, which allows for making precise local cross-sections through the tested elements, up to several hundreds μm depending on the material, making their inner microstructure visible.

Thin films testing

Many industries see the application of specialized coatings in a wide range of complexities and forms. A common critical feature of coatings is their thickness and chemical composition, which often need to meet strict requirements of manufacturers. These parameters translate directly into the quality and reliability of manufactured components. For specialized coatings made of precious and semiprecious metals, their thickness must be strictly controlled within certain ranges. The measurements of coating thickness offered by Nanores Lab allow for precise determination of coating thickness at a location specified by the client. High-resolution imaging mode allows for multi-layer coating measurement starting from 10 nm thickness.

85.94 nm (cs)

23.97 nm (cs)

11.98 nm (cs)

27.0 nm (cs)

9.24 nm (cs)

23.67 nm (cs)

163.1 nm (cs)



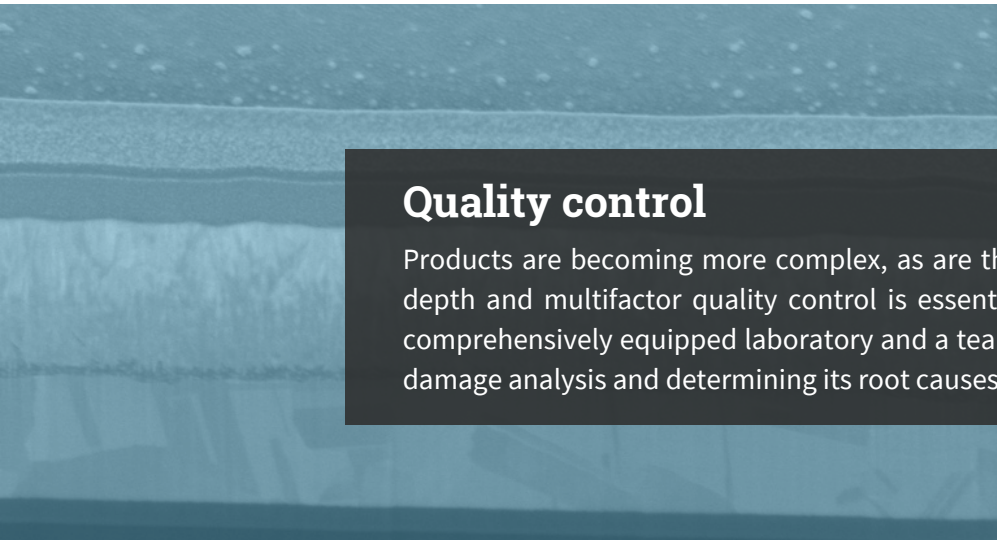
Lithium-ion batteries testing

Comparing to other battery technologies available on the market, lithium-ion batteries are highly efficient energy storage devices, and demand for them continues to grow. Safer, stronger, more economical batteries are now one of development challenges of the future. Nanores Lab offers a number of tools for identification and analysis of defects, faults and failures. By combining analytical techniques such as microcomputed tomography (microCT), scanning and transmission electron microscopy (SEM and TEM), as well as focused ion beam technology (FIB) scientists, engineers and technologists can gain valuable structural and chemical information that they need to improve their processes.



Semiconductors testing

Semiconductor industry continues to develop and the state-of-the-art semiconductor devices are not only getting smaller than their precursors, but also more complex. As a result, they require more sophisticated tools needed for development, prototyping, identification and control of defects, as well as making precise and high-resolution microscopic observations. Scanning electron microscopy (SEM) in combination with focused ion beam (FIB) is a perfect technique that offers high-precision analytical capabilities.



Quality control

Products are becoming more complex, as are the demands placed on them, so a fast, in-depth and multifactor quality control is essential for process management. Thanks to a comprehensively equipped laboratory and a team of experts, complex problems related to damage analysis and determining its root causes can be easily identified and solved.

A scanning electron micrograph (SEM) showing a surface with various irregularities, including small pits, cracks, and larger irregular shapes, illustrating defects in a material.

Defect analysis

Even small defects can have a significant impact on the safety and performance of the final product. The slightest crack or contamination can not only reduce the quality and durability of the product, but also cause disastrous failures. SEM offers magnification and depth of field required for detailed fault analysis and failure identification. It also provides a lot of information to precisely characterize the damage and identify its root cause.

A scanning electron micrograph (SEM) showing a regular array of circular microfluidic holes or wells in a substrate, used for prototyping.

Prototyping

Using our specialist equipment, as well as knowledge and experience, we are able to offer the services of structure prototyping in the following areas: micro- and nanoelectronics (NEMS, MEMS), automatics (micro- and nanofluidics), optics (photonic crystals, micro- and nanolenses) and many others.

A scanning electron micrograph (SEM) showing a complex micro- or nanocomponent structure, featuring a grid of fine lines and larger rectangular features, representing precision manufacturing.

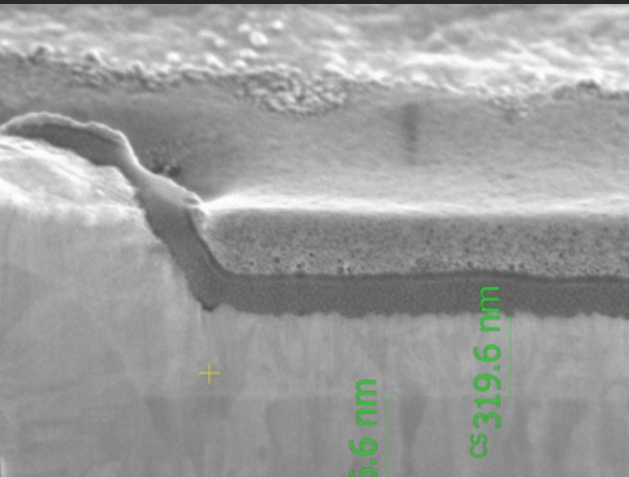
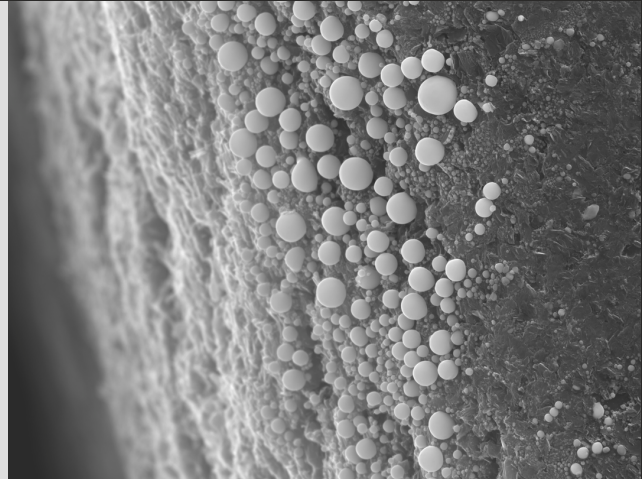
Micro- and nanocomponents production

The manufacture of components at the micro- and nano-scale is a subject of the increasing interest around the world, both in academia and industry. Such components require high precision, repeatability and thorough quality control already at the production stage. Using the high-class equipment, methods and experience of our experts, we are able to manufacture precise components for such industries as: electronics and photonics, optics, automatics, and many others.

testing methods

Surface testing (SEM)

Scanning electron microscope (SEM) images provide information about the morphology or topography of a sample, fracture or polished section. They also allow for the observation and identification of defects even of sub-micron sizes, the measurement of size of grains, pores or other details on the surface. The results of such analyzes provide valuable information to companies and research entities from many industries, such as electronics, chemical, ceramics, metallurgy and many others.

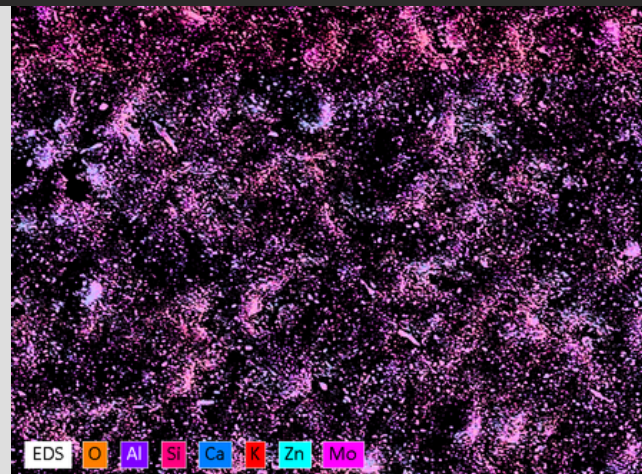


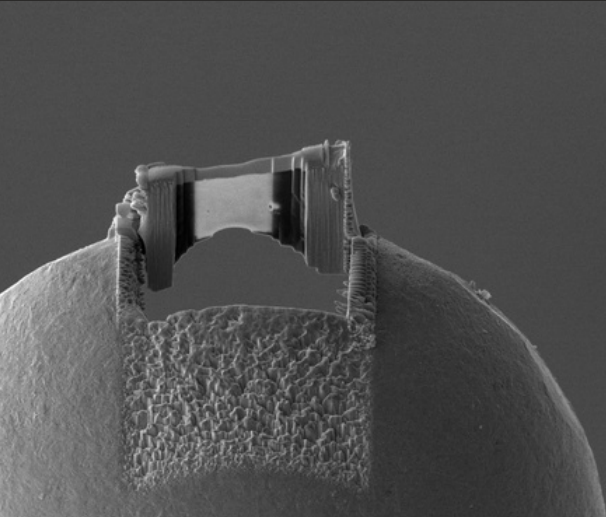
Cross-section tests (SEM/Xe-PFIB/Ga-FIB)

During these tests, a local cross-section is created, the surface of which is polished with an ion beam. This allows for the cross-sectional area analysis of the tested object using electron and ion microscopy techniques. These tests are perfect for **analyzing the quality of sinters, welds and multi-layer structures** (e.g. integrated circuits or anti-reflective coatings).

EDS elemental analysis

During electron beam imaging, the preparation atoms emit characteristic X-rays that are unique to each element. An advanced EDS detector collects this signal and performs elemental analysis pointwise, linearly or on the surface. It is possible to create a map that shows the identified elements arrangement from 4Be to 95Am in a given area of the analyzed sample.



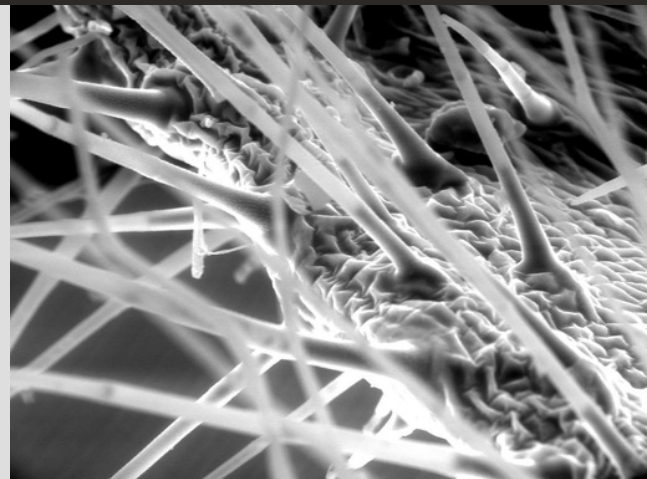


TEM sample preparation

Our offer includes manufacturing extremely thin samples (lamellas) intended for tests using Transmission Electron Microscopy (TEM). The sample thickness that is guaranteed by us is below 100 nm (depending on the material, the sample thickness may even be less than 20 nm). The lamellas are prepared by us from the sample area indicated by the client, polished and ready for TEM observation. The Xe-PFIB technology, due to xenon ions usage, enables the preparation of samples that are incompatible with Ga-FIB technology, including aluminum samples or samples containing gallium.

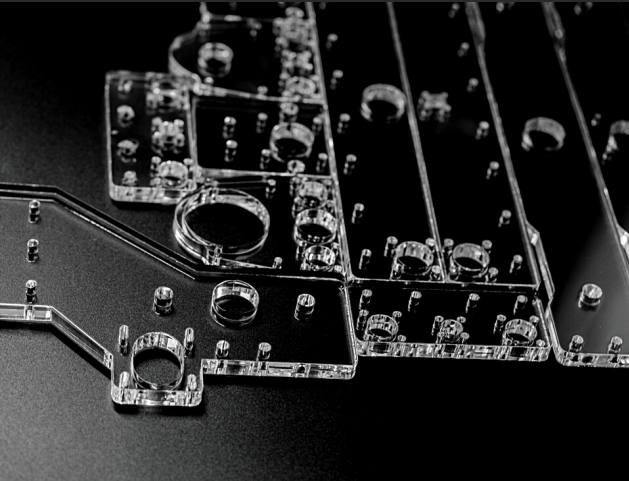
Environmental SEM analysis

Owing to controlled vacuum, environmental SEM imaging allows for testing biological and other preparations that begin to gas under high vacuum conditions. In this mode, we can control humidity and temperature. As a result, various materials can be introduced into the microscope chamber without the need to dry them. These can be samples in liquid and solid form, highly humid samples, and all samples incompatible with high vacuum, e.g. plant and animal tissues.



MiBot Manipulators

Manipulators driven by piezoelectric actuators allow for small electronic circuits and components to be tested and moved with nanometric precision. A set of two MiBot devices, coupled with a scanning electron microscope or a laser confocal microscope, allows for research and testing of submicron elements. Moreover, in combination with external measuring electronics, it enables the determination of resistance and current-voltage characteristics of microelectronic devices, or semiconductor damage analysis.

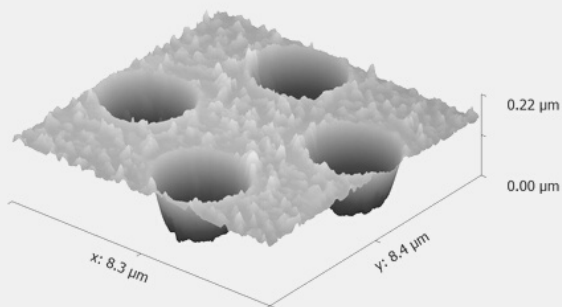
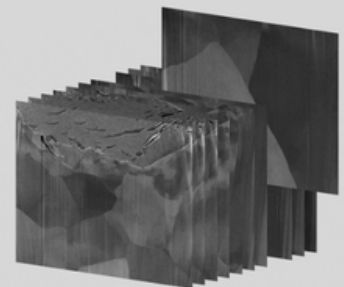


Laser processing (femtosecond laser)

Our workstation can cut difficult materials, e.g. ceramics, diamonds or hardened glass. It is suitable for micro-processing and micro-components production. It is also widely applied in the processing of optical elements (photonic crystals, fiber-optic cables, micro-lenses) and micro-electro-mechanical systems (MEMS). It is used, for example, for drilling micro-holes with profiled, smooth edges, cutting out elements or materials marking.

3D Reconstruction (SEM/Xe-PFIB/Ga-FIB)

With our advanced devices and professional software, we are able to perform cross-sections series and then record them in a micro- and nanometric scale. The results of this process can then be transformed into high-quality 3D reconstructions of the sample microstructure. This enables the structural changes verification and their statistical analysis within a certain sample volume.



Surface testing (AFM)

Surface testing using an atomic force microscope is an ideal method of examining the materials roughness and verifying the correctness of the processes of applying all layers at any production stage.

industries who we are for?



universities and
research institutes



start-ups



industry



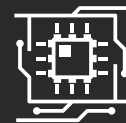
electronics and
photonics



aerospace &
automotive
industry



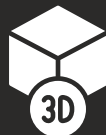
army



semiconductors



batteries and
renewable energy
resources



3D printing



nanotechnology



jewelry industry



partners



..... and much more



contact

Please contact us with the request,
so that we can make you the most affordable
individual offer.

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