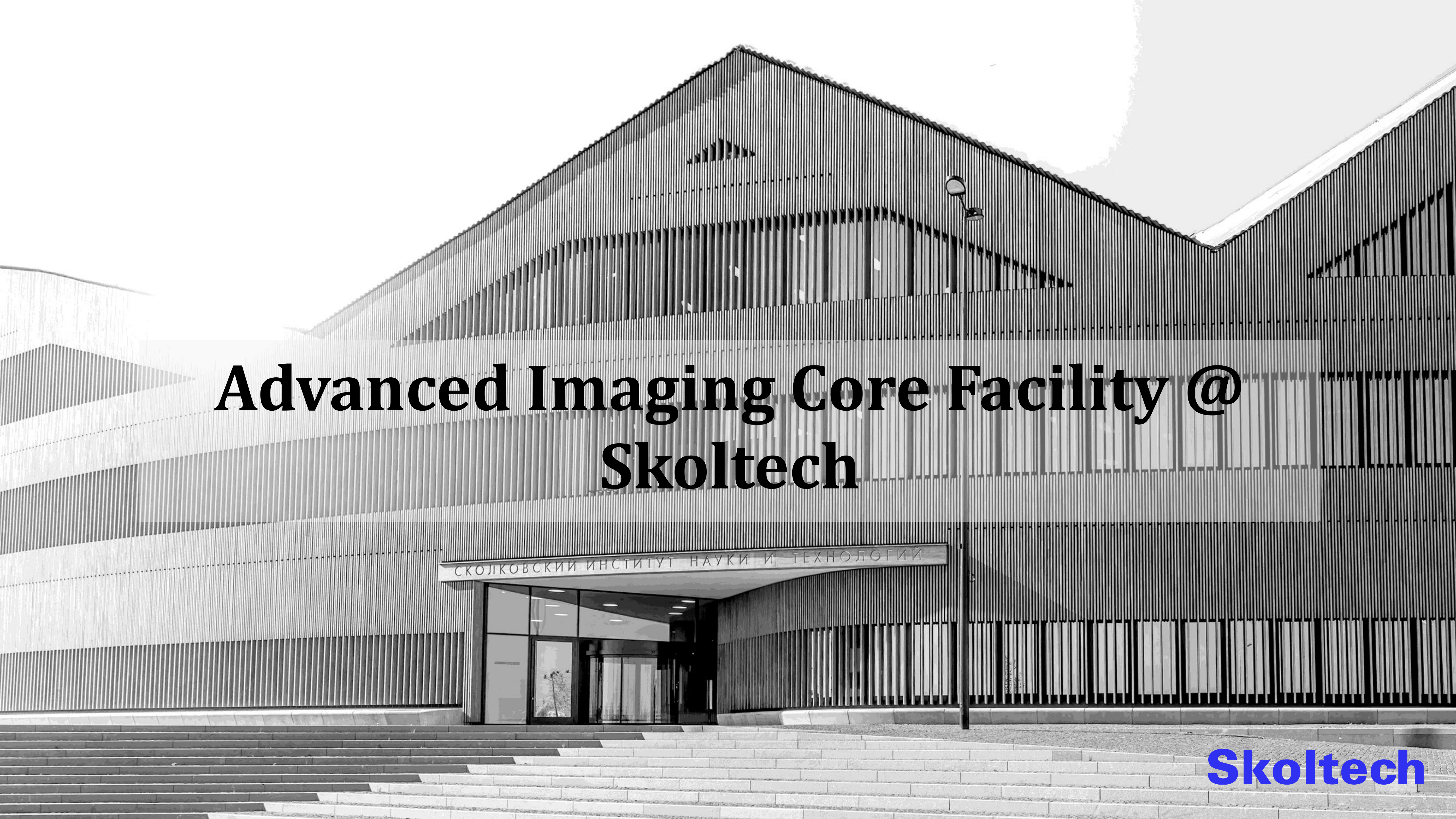
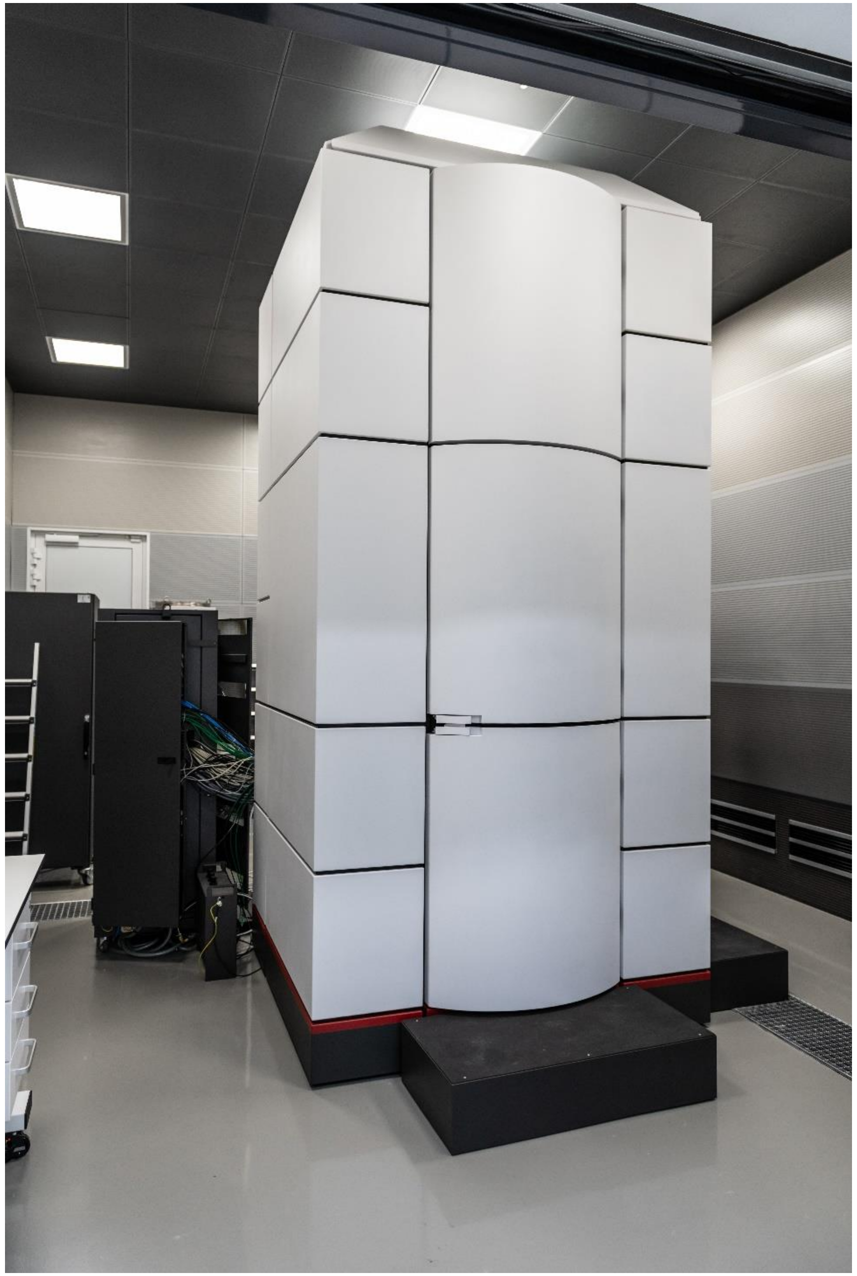
Advanced Imaging Core Facility @ Skoltech



Skoltech

Equipment catalog



Transmission electron microscope Titan Themis Z

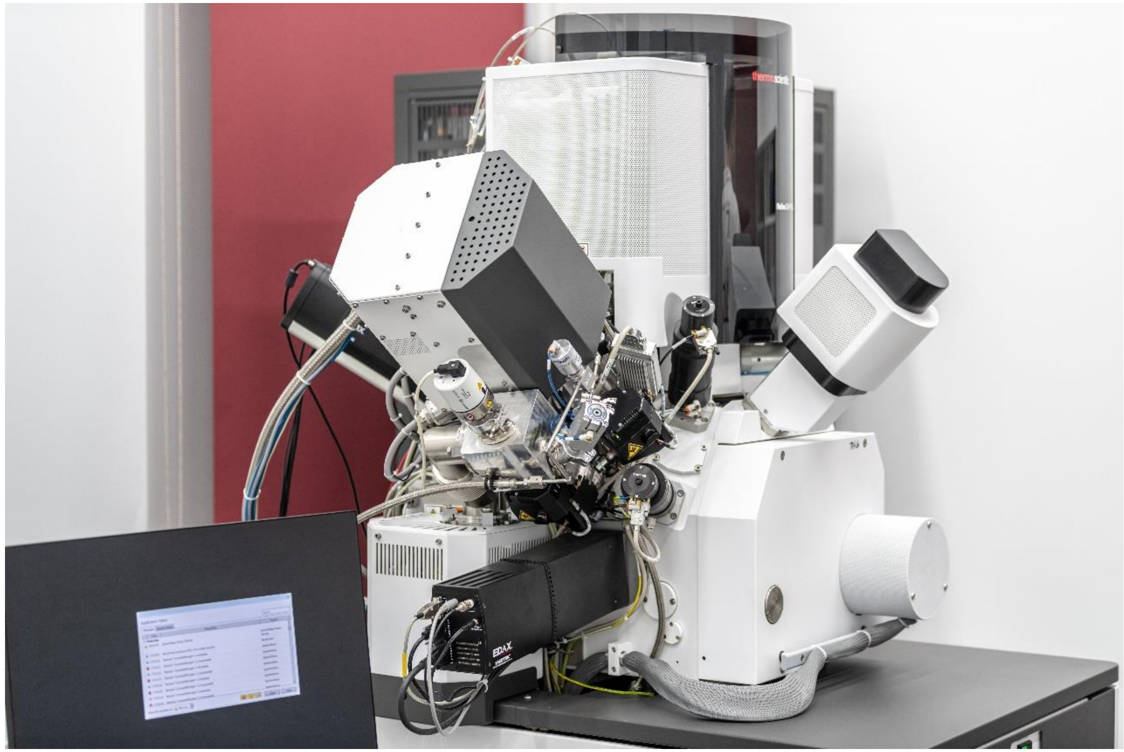
Transmission electron microscope Titan Themis Z allows us to study the microstructure, crystal structure and etc. of wide range samples. Titan Themis Z is equipped with a corrector of spherical aberrations, which significantly improves the resolution of the microscope. The microscope is equipped with various detectors for investigation of local chemical composition using energy dispersive X-ray spectroscopy (Super-X EDX detector) and characteristic electron energy loss spectroscopy (Quantum 965). Large number of techniques used in electron microscopy, such as HRTEM, HRSTEM, EDX, EELS, Mono-STEM-EELS, STEM-EELS, HAADF, ABF, etc., help us to obtain complete information about microstructure, crystal structure, phase and chemical composition of materials.

Production year, manufacturer, country of manufacture: 2017, TFS (ThermoFisherScientific), Netherlands

Technical characteristics:

TEM resolution 120 pm;
STEM Cs corrected resolution 60 pm;
Monochromator resolution 0.15 eV;
Resolution at 80 kV: 100 pm;
Ultra-stable, high brightness Schottky field emitter gun (X-FEG);
Accelerating voltage range: 80 kV, 120 kV, 200 kV, 300 kV;
Super-X EDX detector for energy dispersive X-Ray spectroscopy (≤ 136 eV for Mn-Kα and 10 kcps, ≤ 140 eV for Mn-Kα and 100 kcps);
Quantum 965 GIF detector for electron energy loss spectroscopy;
Full automatic control.

Equipment catalog



Dual beam scanning electron microscope Helios G4 Plasma FIB Uxe

Dual beam scanning electron microscope Helios G4 Plasma FIB Uxe is equipped with two columns: electron column Elstar with high-precision UC+ technology for obtaining high-resolution images and ion column Phoenix for the fastest, easiest and most accurate sample preparation for transmission electron microscopy. Combination of two columns The Helios G4 Plasma FIB Uxe microscope is equipped with various detectors such as ETD, TLD, DBS, EDX, EBSD, STEM 3+ detectors, with the ability to work in BF, DF and HAADF modes, which allows us to study morphology, particles size, coatings, heterostuctures, elemental and phase compositions, crystallographic orientation of grains and etc.

Production year, manufacturer, country of manufacture: 2017, TFS (ThermoFisherScientific), Netherlands

Technical characteristics:

Electron beam resolution (E-beam):
0.6 nm at 30 kV (STEM);
0.6 nm at 15 kV-2 kV;

Ion beam resolution (I-beam):
4.0 nm при 30 kV using preferred statistical method;
2.5 nm при 30 kV using selective edge method;

Landing voltage range:
E-beam: 20 V - 30 kV;
I-beam: 500 V - 30 kV;

Probe current:
E-beam: >0.8 pA;
I-beam: 0.1 pA – 2.5 μA.

Skoltech

Equipment catalog

Dual beam scanning electron microscope Tescan Solaris

TESCAN SOLARIS is a turn-key FIB-SEM solution for the fabrication of nanostructures and nanotechnology-inspired microscale functional devices. TESCAN SOLARIS combines the most precise Focused Ion Beam with UHR-SEM featuring TriLens™ immersion optics, to ensure the best possible connection between ion beam milling and ultra-high-resolution SEM imaging.
The Orage™ Ga+ FIB column was designed to meet increasingly stringent focused ion beam nanofabrication requirements. The TESCAN SOLARIS microscope is equipped with EDX, ToF-SIMS, EBSD detectors which allows us to study elemental and phase compositions, crystallographic orientation of grains and etc.

Production year, manufacturer, country of manufacture: 2019, Tescan, Czech Republic

Technical characteristics:

Electron beam resolution (E-beam):
0.6 nm at 15 kV ;
1.2 nm at 1 kV;

Ion beam resolution (I-beam):
2.5 nm при 30 kV;

Landing voltage range:
E-beam: 500 V - 30 kV;
I-beam: 500 V - 30 kV;

Probe current:
E-beam: up to 400 nA;
I-beam: < 1 pA – 100 nA.

Skoltech

Equipment catalog

Scanning electron microscope Quattro S

The Quattro S scanning electron microscope allows us to investigate a wide range of materials up to biological objects using various modes of such as high vacuum mode, low vacuum mode up to 200 Pa or environmental mode up to 4000 Pa. The morphology of particles, coatings and thin films, the structure of metals and alloys, etc., as well as their elemental and phase composition can be investigated using a Quattro S microscope equipped with EDX detector.

Production year, manufacturer, country of manufacture: 2017, TFS (ThermoFisherScientific), Netherlands

Technical characteristics:
Electron beam resolution
High-vacuum imaging
1.0 nm at 30 kV
Low-vacuum imaging up to 200 Pa
1.3 nm at 30 kV (SE)
3.0 nm at 3 kV (SE)
ESEM up to 4000 Pa
1.3 nm at 30 kV (SE)
Beam current range:
1 pA to 200 nA
Accelerating voltage range:
200 V – 30 kV
Landing energy range:
20 eV – 30 keV with optional beam deceleration.

Equipment catalog

Optical microscope Leica DM2700M

Optical microscope Leica DM2700M with an ultra-bright LED light source (4500 K) and with an updated optical system, expands the possibilities of optical microscopy for a wide range of scientific problems. Optical microscope Leica DM2700M allows us to obtain images in bright-field, dark-field and other modes. The microscope is equipped with a 5-lens revolver with working magnifications of x5, x10, x20, x50 and x100. The Leica DM2700M is designed for research in the field of materials science, mineralogy, geology and other fields of science.

Production year, manufacturer, country of manufacture: 2019, Leica Microsystems GmbH, Germany

Technical characteristics:

The maximum magnification of the microscope ×1000 (a set of lenses ×5, ×10, ×20, ×50 and ×100)
Bright Field Reflector Module BF
Dark Field Reflector Module DF
Sample stage 4×4 ceramic coated with glass insert
Digital Camera Leica MC170HD
LAS Measurment software package for measuring geometric parameters.

Equipment catalog

Optical microscope Leica DM 4M

Research microscope Leica DM 4M, which uses an ultra-bright LED light source, provides contrast images in bright-field or dark-field modes. The microscope is equipped with a 5-lens revolver with working magnifications of x5, x10, x20, x50 and x100. Optical microscope Leica DM 4M is designed for research in the field of materials science, geology and mineralogy.

Production year, manufacturer, country of manufacture: 2019, Leica Microsystems GmbH, Germany

Technical characteristics:

The maximum magnification of the microscope ×1000 (a set of lenses ×5, ×10, ×20, ×50 and ×100)
Bright Field Reflector Module BF
Dark Field Reflector Module DF
Mechanical sample stage with shifting range of 102×102 mm
Digital Camera Leica MC170HD
LAS Measurment software package for measuring geometric parameters.

Equipment catalog

Automatic cutting machine Accutom-100

Accutom-100 automatic high-precision cutting machine is designed for high-precision cutting and grinding of samples. The Accutom-100 is controlled through an intuitive user interface, which ensures high productivity. The Accutom-100 automatic cutting machine is equipped with a wide range of sample holders (holder for long samples, holder for round and square samples, holder for non-standard samples, holder for small samples) and is equipped with cutting discs to work with various materials, from soft to hard.

Production year, manufacturer, country of manufacture: 2019, Struers, Denmark

Technical characteristics:

Maximum sample size – 250×150×100 mm^3
Disc rotation speed – 300-5000 rpm
Disc feed rate – 0.005-3.000 mm / s
Hardness of processed materials – HV 30-400, HV 200-500, HV 500-800, HV> 800
4 sample holders (round cylindrical samples clamp maximum diameter 10 mm, for filling clamp maximum diameter 40 mm, for small samples clamp maximum diameter 15 mm, for irregularly shaped clamps minimum thickness 10 mm.

Equipment catalog

Automatic programmable and high-precision cutting machine TechCut 5

High-speed, programmable and high-precision cutting machine TechCut 5 designed for cutting various materials with high speed. TechCut is equipped with two stubs: T-Slot Table and the X-Axis Tables, on which various samples holders such as a double saddle vice, a quick-sliding vice, a holder for attaching to the surface, a multi-purpose holder, a drop-shaped holder, a holder for pressing-in, a holder for direct samples can be mounted. TechCut 5 is equipped with diamond and abrasive cutting discs to cut materials from soft to hard.

Production year, manufacturer, country of manufacture: 2018, Allied, USA

Technical characteristics:

Cutting disc rotation speed – 500-5000 rpm with increments of 100 rpm
Table feed speed along the Y axis – 1.27-76.2 mm / min
Maximum sample size 152×152×64 mm^3
Adjustable level of effort during the cutting process – low, medium and high.

Equipment catalog

Automatic programmable electro-hydraulic mounting press TechPress 3

The TechPress 3 is hydraulic automatic mounting press is designed to encapsulate samples for various purposes. The TechPress 3 is controlled through an intuitive user interface, which ensures high productivity.

Production year, manufacturer, country of manufacture: 2018, Allied, USA

Technical characteristics:

The range of diameters of the press fit is 25-51 mm
Heating power – 1500 W
Pressing pressure up to 310 bar
Heating/pressing temperature – 0-200 °C with increments of 1 °C
Heating time – 0-99 minutes with increments of 1 s.

Automatic grinding and polishing machine LaboPol-30+LaboForce-100+LaboDoser-100

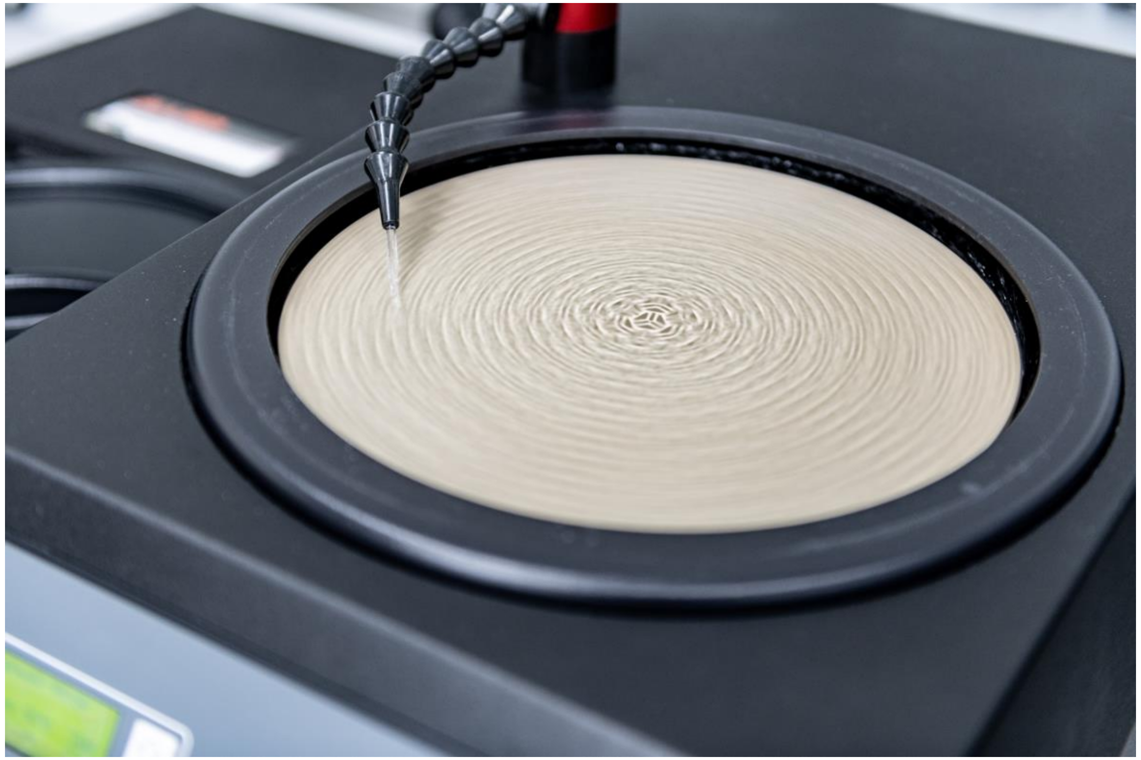
Grinding and polishing machine LaboPol-30 is designed for quick grinding and polishing of samples with speed control from 50 to 500 rpm. In addition, the LaboPol-30 is equipped with a LaboForce-100 semi-automatic rotator for 6 samples and a LaboDoser-100 dosing unit for automatic delivery of diamond suspensions to the polishing zone. LaboPol-30 grinding and polishing machine is equipped with grinding wheels to work with various materials.

Production year, manufacturer, country of manufacture: 2019, Struers, Denmark

Technical characteristics:

The diameter of the drive wheel – 300 mm
Rotation speed of the drive wheel – 50-500 rpm
Range of adjustment of water supply or polishing slurry - program volume adjustment from 0-10 where 0 – no feed, 3 – 1 drop\sec, 7 – a few drops\sec, 10 – a thin stream
The maximum number of samples in the automatic grinding and polishing mode is a carousel for 6 samples with diameter 40 mm, a carousel for 6 samples with diameter 25 mm.

Equipment catalog



Programmable high-precision grinding and polishing machine MetPrep1

MetPrep 1™ for SEM sample prep grinding and polishing machine is designed for manual sample preparation for standard application including scanning electron microscopy. MetPrep 1™ for SEM sample prep can easily control platen rotation speed and coolant (water) flow.

Production year, manufacturer, country of manufacture: 2018, Allied, USA

Technical characteristics:

The diameter of the drive wheel – 203 mm
Rotation speed of the drive wheel – 5-350 rpm with increments of 5 rpm
Vertical runout of a precision circle no more than 4 microns
Possibility of programming up to 25 of polishing steps, including drive wheel rotation speed, drive wheel rotation direction, operation duration, water on/off.

Equipment catalog

High-precision half-automated grinding and polishing machine MultiPrepTEM System8

MultiPrep™ System 8" for TEM sample prep grinding and polishing machine is designed for high-precision semiautomatic sample preparation. Capabilities include parallel polishing, angle polishing, site-specific polishing or any combination thereof.
Dual micrometers allow precise control sample tilt adjustments and also MultiPrep™ System 8" for TEM sample prep grinding and polishing machine is allows to control real-time material removal during grinding. Adjustable load control expands its capability to handle a range of small (delicate) to large samples.

Production year, manufacturer, country of manufacture: 2018, Allied, USA

Technical characteristics:

The diameter of the drive wheel – 203 mm
Rotation speed of the drive wheel – 5-350 rpm with increments of 5 rpm
Accuracy of control of the amount of material removal 1 μm
2-axis micrometer-controlled angular positioning of the sample within ÷10/-2.5° with an accuracy of 0.02 °
The loading range is 0-600 g with increments of 100 g.

Equipment catalog

Automatic machine for electrolytic polishing and etching of samples LectroPol5

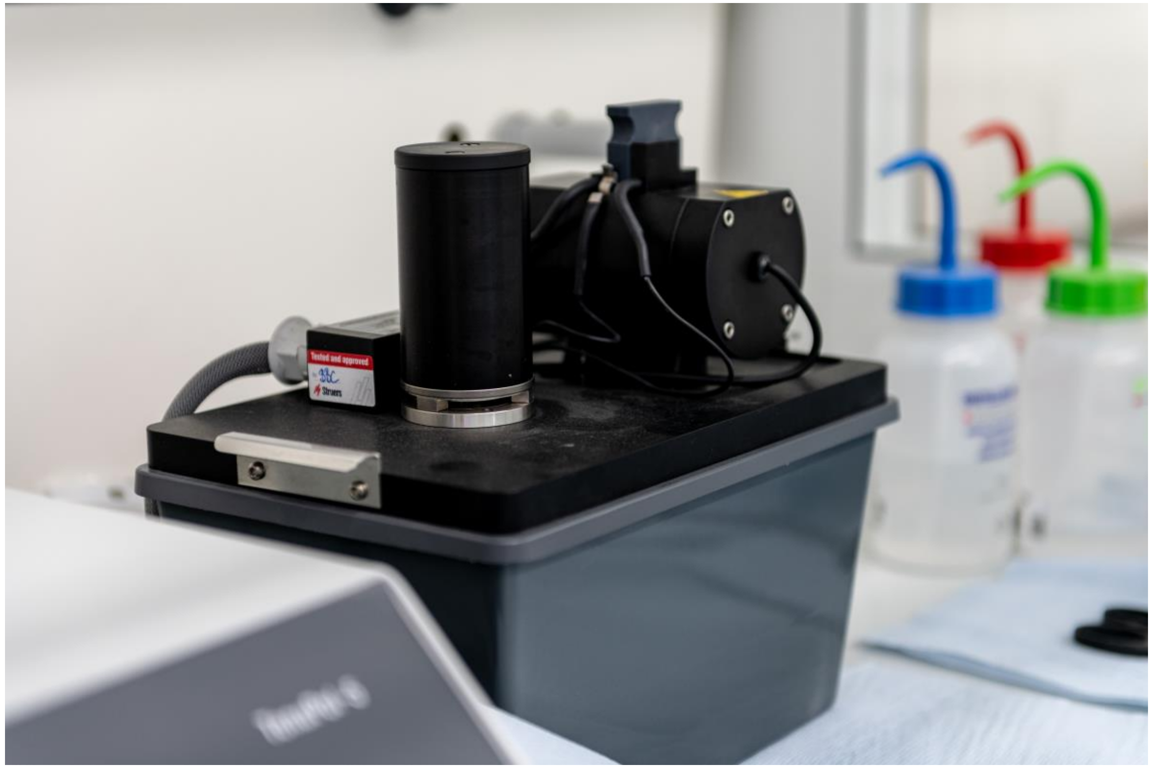
LectroPol-5 electropolishing machine is designed for automatic electrolytic polishing and etching of samples for scanning electron microscopy. A scanning function will help to determine optimal parameters for electrolytic polishing of samples. User interface is allows us to create the database of methods for electropolishing. It is possible to make electropolishing of samples at low temperature.

Production year, manufacturer, country of manufacture: 2019, Struers, Denmark

Technical characteristics:

Maximum sample size: diameter 12-21 mm, thickness 1.0 mm; diameter 3.0 mm, thickness 0.5 mm; diameter 2.3 mm, thickness 0.5 mm
Sample voltage: 0-100 V (0.1 V step)
Electrolyte temperature: from -50 ºC to 35 ºC (cooling with liquid nitrogen).

Equipment catalog



Automatic machine for electrolytic foil preparation TenuPol5

TenuPol-5 is designed for automatic electrolytic foil preparation for transmission electron microscopy. A scanning function will lead to easier determination of optimal electropolishing parameters for sample, electrolyte speed control will provide high-precision thinning of foil and it’s possible to make a foil at low temperature.

Production year, manufacturer, country of manufacture: 2019, Struers, Denmark

Technical characteristics:

Maximum sample size: diameter 3 mm, thickness 100 μm
Sample voltage: 0-100 V (0.1 V step)
Electrolyte temperature: from -50 ºC to 35 ºC (cooling with liquid nitrogen).

Equipment catalog

Ion Beam Milling System Leica RES102

Leica EM RES102 Ion Beam Milling System is designed for ion polishing of samples for scanning and transmission electron microscopy. Leica EM RES102 is equipped with two ion sources with a saddle-shaped field, providing variable particle energy and high productivity.

Production year, manufacturer, country of manufacture: 2019, Leica Microsystems GmbH, Germany

Technical characteristics:

Voltage range – 0.8-10 kV
Angle range from -45 to + 45°
Maximum sample sizes:
SEM – maximum diameter 25 mm, height 6 mm
Slopecutting - maximum height 5 mm, thickness 3 mm, length 15 mm
TEM – the minimum thickness is 50 μm, the maximum diameter is 14 mm, the etch diameter is 3 mm and 2.3 mm.

Equipment catalog

Magnetron sputtering machine Quorum Q150R ES

The Q150R ES is a fully automatic, compact, combined system with interchangeable inserts for sputter coating or carbon evaporation system suitable for SEM and other applications.
The deposition head inserts can be swapped in seconds and the intelligent system logic automatically recognizes which insert is in place and displays the appropriate operating settings.

Production year, manufacturer, country of manufacture: 2018, Quorum, England

Technical characteristics:

Diameter of the vacuum chamber – 165 mm
Current range – 1-80 mA
Spraying time range – 1-3600 sec.
Maximum sample size – height 30 mm, diameter 140 mm
Number of samples 6 standard tables for EMS
Fully automatic control via a color touch screen provides quick data entry and easy operation.
Targets in stock – Au, C, Pt, Cr, Al.

Equipment catalog

Modular glove box with one treatment column MB-Unliab Pro

LABstar Glove Box Workstation is used for sample preparation in an airless and anhydrous atmosphere for scanning and transmission electron microscopy.

Production year, manufacturer, country of manufacture: 2019, MBraun, China

Technical characteristics :

Purity of the atmosphere inside the glove box: oxygen and water <1 ppm
The diameter of the small gateway – 150 mm
The diameter of the large gateway – 400 mm.