Leica EM MED020

The Modular High Vacuum Coating System

Many applications – One single unit

Living up to Life

Leica
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Unique Modular High Vacuum Coating System

The Leica EM MED020 is a precision high vacuum preparation system and the only instrument to offer the widest range of coating configurations in one single unit.

The clean high-vacuum pump in combination with multiple coating systems provides high resolution sputter or carbon coating for the latest high resolution field emission SEMs, TEMs as well as vacuum coatings for various applications in optics, physics or electronics.

Available for all applications using the Leica EM MED020 is the EM QSG100, a quartz crystal film thickness monitor system which ensures highest reproducibility of sputtered or evaporated layers by precisely measuring film thickness and coating rates.

Optional modules allow cryo preparation methods including freeze drying, freeze fracturing, freeze etching and coating for cryo SEM, FIB, AFM, SIMS or XPS observation.

The versatility of the Leica EM MED020 surpasses all other conventional instruments and has added much value to research requirements worldwide.

The Leica EM MED020 is a unique modular unit that accommodates a wide range of quick and easy conversions. Users can choose from configurations most suitable to their application needs.

- High vacuum sputtering
- Carbon thread evaporation
- Carbon rod evaporation
- Thermal resistance evaporation
- Electron beam evaporation

In combination with the Leica EM VCT100:

- Freeze fracture
- Freeze drying
- Freeze etching
- Double replica
- Cryo coating for cryo SEM
- High vacuum cryo transfer for observation of frozen samples

Leica Design by Werner Hölbl

More than the Sum of its Parts

Not only is a the Leica EM MED020 a highly versatile system, the compact bench top unit is uniquely designed to offer users a simple method for attaining best quality results. Process modules can be quickly changed to accommodate any application. A variety of sample holders, sputter targets and other consumables are available.

- **Auto-lift system** for easy feeding and setting of various evaporation sources.
- **Pre-selectable and permanently stored sputtering parameters** for reproducible results.
- **Quick click system** with integrated safety system for easy, safe and quick change of all coating systems.
- **Stepless adjustment of working distance** for flexible coating rate and distribution settings.
- **Variety of quality vacuum chambers** guaranteed for vacuum performance. Removable for easy cleaning and convenient for switching between different processes.
- **High performance oil-free vacuum and pumping system:** no oil back-stream, no contamination, high film quality.

A **glow discharge device** offers better adhesion of the coating layer, enables material to be sputtered off the sample, provides an “etching” effect for cleaning and makes carbon coatings hydrophilic.

- **A bayonet foil target replacement** system provides ideal thermal contact for good film quality.
- **Programmable timer** – with process termination for defined film deposition and reproducible coatings.
- **Integrated shutter** for pre-sputtering protects against specimen contamination prior to removing oxide layers from the target.
- **Variable vacuum chamber geometry** suited for various specimen shapes and dimensions.
- **Rotary-planetary-tilting stages** provide shadowing at pre-selectable coating angles, multiple angle movements and rapid configuration modifications.
- **No cross-contamination** between metal and carbon coating applications.

EM QSG100 Quartz Crystal Film Thickness Monitor
The Leica EM QSG100 is a quartz crystal film thickness monitoring system which ensures highest reproducibility of sputtered or evaporated layers by precisely measuring film thickness and coating rates. The EM QSG100 can be used with all EM MED020 applications.

EM QSG100 Features:
– Shutter termination for easy and safe replica production. Film thickness termination adjustable to 1 nm.
– Optimized quartz head positioning for exact thickness measurement.
– Memory functions: 5 layers with independent thickness values.
– Programmable layer sequences for multiple coating layers.
– Integrated library for multiple coating materials.

The Most Configurations …

High Vacuum Sputtering

High vacuum sputtering is used to produce very fine-grained metal films. With the Leica EM MED020 even very fissured specimen surfaces can be evenly and thinly coated for high resolution FE-SEM.

A cooled planar magnetron sputtering device with electron deflection produces uniform and reproducible single metal coatings at high sputtering power. A cooled triple sputtering device offers a multiple metal layer system of three different sources sputtered by planar magnetron without the need for chamber ventilation or vacuum termination.

Applications:

- Fine-grained sputter coatings for high resolution SEM
- Conductive coatings on large scale samples (wafers, compact discs, etc)
- Metal films using Aluminium, Chromium, Cobalt, Copper, Gold, Gold/Palladium, Iridium, Iron, Molybdenum, Nickel, Platinum, Silver, Titanium and Tungsten for industrial processes
- Multiple layer systems
- Cryo coating for analysis of frozen samples using the Leica EM VCT100 cryo transfer system

High vacuum single sputtering with a planetary drive stage and SEM stub mounts.

High vacuum sputtering using the bottom flange heating stage.

Triple high vacuum sputtering of a wafer on the height adjustable rotary stage.

… a Single Coater Can Offer

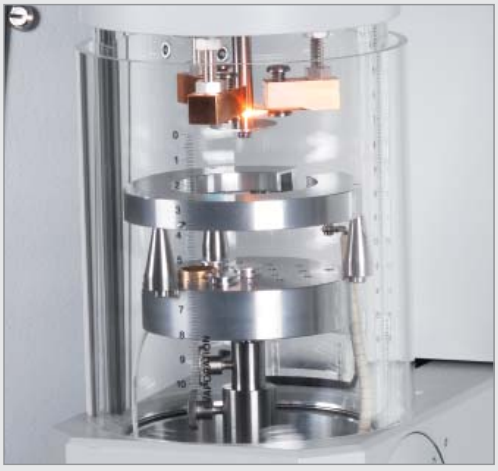
Carbon Thread and Carbon Rod Evaporation

Carbon thread coating involves a process known as “flash evaporation” where a thread is heated, flashes off carbon and breaks leaving carbon atoms on the sample. With the Leica EM MED020 a uniform, fine-grained, electrically-conductive film forms evenly on the sample surface in a very short cycle time.

Carbon rod evaporation is the process of carbon coating material by electrically heating the tips of carbon rods. A precise film thickness can be pre-selected. The production of multiple carbon and carbon metal mix coatings without breaking vacuum is possible.

Application:

- Conductive carbon films on specimens for X-ray microanalysis (EDX, WDX)
- Carbon reinforcement films on collodion or formvar coated specimen support grids
- Carbon support films can be made hydrophilic using the glow discharge device
- Normal, portrait, rotary and low angle shadowing (for carbon rod evaporation only)
- Fine-grained carbon or carbon/metal mix coatings for high resolution TEM/SEM (for carbon rod evaporation only)
- Replicas and interference coatings (for carbon rod evaporation only)
- Multiple layer metal and non-metal systems for industrial processes (for carbon rod evaporation only)



Carbon thread evaporation with glow discharge.

Carbon rod evaporation of specimens on grids using a tiltable stage.

The Possibilities are Many

Electron Beam Evaporation

The electron beam evaporator of the Leica EM MED020 is designed to evaporate refractory metals, such as tungsten or a tungsten alloy, carbon-metal mixtures and pure carbon. A rod shaped evaporation material is clamped into a rod holder surrounded by a heated coil which emits electrons. The acceleration energy of the electrons is converted to heat as it impacts on the face of the evaporator rod. It heats the rod and causes the rod material to be evaporated.

With the Leica EM MED020 electron beam evaporation method, the highest quality of resolution of fine-grained film can be achieved.

Application:

- Carbon reinforcement films on collodium or formvar coated specimen support grids
- Conductive carbon films on specimens for X-ray microanalysis (EDX, WDX)
- Fine-grained carbon, metal or carbon/metal mix coatings for high resolution TEM/SEM
- Specimen replication by evaporation of carbon, metals and carbon/metal mix coatings
- Interference coatings
- Multiple layer systems without interruption of the vacuum
- Normal, portrait, rotary and low angle shadowing
- Cryo coating for analysis of frozen samples using the Leica EM VCT100 cryo transfer system
- Carbon support films can be made hydrophilic using the glow discharge process

Production of the finest grained coatings with e-beam evaporation at highest vacuum conditions using a LN_2 cold trap.

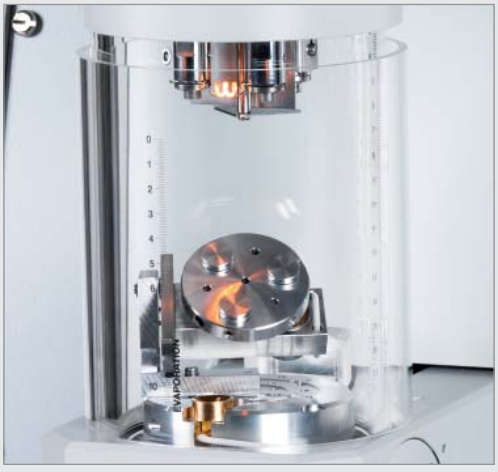
Thermal Resistance Evaporation

Thermal resistance evaporation is a means of coating samples with either metals, salts, oxides, or organic compounds (e.g. pigments). A metal support (boat or basket) holds the material and is heated until the substance evaporates. It is highly recommended for diverse industrial coating processes.

The Leica EM MED020 offers thermal resistance evaporation bottom up for sequential coating of two substances and top down using metal or material melted in wire baskets or boats.

Application:

- Multiple layer systems without interruption of the vacuum
- Technical layer systems made of metal and non-metal for industrial processes



Thermal resistance evaporation top down with tungsten coil, tiltable rotary stage, SEM stubs on a 54 mm diameter specimen table.

Combination of thermal resistance evaporation bottom up and high vacuum sputtering which offers the possibility of multiple layer systems with three different coating materials without breaking vacuum.

The Ideal Solution for Cryo Sample Preparation

Freeze Etch/Fracture System with the Leica EM VCT100
The term freeze fracture encompasses a series of techniques which reveals and replicates internal components of organelles and other membrane structures for examination in the electron microscope. Freeze etching removes layers of ice by sublimation and exposes membrane surfaces that were originally hidden.

The Leica EM VCT100 is a complementary unit which attaches to the Leica EM MED020 for best freeze etch fracture results with or without subsequent coating. Depending on your preparation needs, specially designed specimen holders and carriers are available. Using the optional electron beam evaporation module, films can be produced with shadowing effects as well as replicas for TEM analysis.

The Leica EM VCT100 cryo transfer system also cross-links with the Leica EM MED020 and an analysis instrument. A cryo coated sample can be transferred contamination-free under vacuum and low temperature using the EM VCT100 shuttle to any vacuum operated SEM, FIB, SIMS, AFM or XPS chamber for subsequent cryo observation.

Freeze etch/fracture unit with the Leica EM VCT100 shuttle attached.

From preparation to imaging, the EM VCT100 is a complete cryo transfer system. Its components include among others a cryo preparation workstation, transfer shuttle, docking station, a controlled cold stage (-150°C to +60°C), LN_2 Dewar and operating panel with touch screen.

For docking to a SEM or different analysis instrument such as AFM, SIMS, XPS, etc., a cryo adaption kit with cryo stage is included. For more information see the Leica EM VCT100 brochure.

Freeze Drying
Freeze drying, also known as lyophilisation, removes water from a frozen specimen under high vacuum conditions (sublimation).

The Leica EM MED020 Freeze Drying Unit is an ideal system for precision controlled freeze drying of SEM samples or TEM cryo sections. It offers reproducible results through exact temperature control of the specimen stage. The modular design of the Leica EM MED020 allows transfer of specimens through a counter flow loading device and subsequent coating through sputtering or evaporation.

Freeze drying unit with electron beam evaporation using two e-beam sources, a counter flow loading device and specimen holder.

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Leica Microsystems

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• Life Science Division

The Leica Microsystems Life Science Division supports the imaging needs of the scientific community with advanced innovation and technical expertise for the visualization, measurement, and analysis of microstructures. Our strong focus on understanding scientific applications puts Leica Microsystems’ customers at the leading edge of science.

• Industry Division

The Leica Microsystems Industry Division’s focus is to support customers’ pursuit of the highest quality end result. Leica Microsystems provide the best and most innovative imaging systems to see, measure, and analyze the microstructures in routine and research industrial applications, materials science, quality control, forensic science investigation, and educational applications.

• Biosystems Division

The Leica Microsystems Biosystems Division brings histopathology labs and researchers the highest-quality, most comprehensive product range. From patient to pathologist, the range includes the ideal product for each histology step and high-productivity workflow solutions for the entire lab. With complete histology systems featuring innovative automation and Novocastra™ reagents, Leica Microsystems creates better patient care through rapid turnaround, diagnostic confidence, and close customer collaboration.

• Surgical Division

The Leica Microsystems Surgical Division’s focus is to partner with and support surgeons and their care of patients with the highest-quality, most innovative surgical microscope technology today and into the future.

The statement by Ernst Leitz in 1907, “with the user, for the user,” describes the fruitful collaboration with end users and driving force of innovation at Leica Microsystems. We have developed five brand values to live up to this tradition: Pioneering, High-end Quality, Team Spirit, Dedication to Science, and Continuous Improvement. For us, living up to these values means: **Living up to Life**.

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