MULTIPROBE
A Family of Multi-Technique UHV Surface Science Systems

- Standard, Turn-Key UHV Systems
- Characterisation, Analysis & Deposition Techniques From a Single Supplier
- Customised Solutions Tailored to Requirements
- Outstanding Quality & Excellent Durability
- Rigid Designs for Maximum Stability in SPM, SEM, SAM & PEEM
The modular and compact design of the MULTIPROBE systems has proven itself more than 1000-times and forms the core module for multi-technique Ultra-High-Vacuum (UHV) applications.

Based on many years of innovation and development, Omicron’s MULTIPROBE systems offer unrivalled versatility and performance in both, standard and customised configurations. Numerous variations and a modular design concept ensure that an individual solution can be found for every customer. This applies equally to very compact and to extremely complex systems. A typical comprehensive MULTIPROBE system combines UHV SPM (at variable or dedicated low temperatures) and electron spectroscopy techniques (Mono-XPS, UPS, AES/SAM...) with thin film growth facilities (MBE, PLD, Sputtering, etc.). Our strength is to combine a wide range of techniques in a single UHV system - with uncompromised performance. We call this the “Multi-technique philosophy”.

Dedicated MULTIPROBE Systems

Our flexibility has led to the development of several dedicated MULTIPROBE systems. A quick overview of the various MULTIPROBE systems is shown on the rear of this brochure. Further system designs dedicated to the exact application can be found in separate brochures, for example, our dedicated MBE system brochure.
MULTIPROBE System Features

**Bench & Chambers**
A combination of a rigid bench construction and optional air damping legs allow ultimate SEM/SAM or SPM resolution in a range of operating environments. All chambers are made of either non-magnetic stainless steel or Mu-metal for efficient magnetic shielding. The analysis chambers provide additional ports for future upgrades of the system with additional techniques.

**Bake Out**
MULTIPROBE systems are equipped with a system and bakeout controller that allows simple and easy handling of the complete vacuum system including the operation of pumps, valves, vacuum interlocks and bakeout. The programmable and interlocked bakeout guarantees system safety and ease-of-operation. Electro-pneumatic gate valves on the turbomolecular pumps protect the chamber from backstreaming in the case of power failure. Rigid and easy to assemble bakeout panels speed up the bakeout procedures.

**Sample Heating / Cooling**
Standard sample manipulators have x,y,z travel and primary rotation and are fitted as standard with a resistive pyrolytic boron nitride sample heater for temperatures >900 °C. Many additional options are available including for example secondary rotation (azimuthal) or tilt. Further sample heating options permit direct current heating of semiconductors up to >1200 °C, or e-beam heating (up to > 1100 °C) for metals and even higher temperature > 1400 °C are possible. LN₂ and LHe cryogenic options are also available.

**Pumping Configuration**
The standard pumping configuration uses a combination of turbomolecular-, ion getter- and titanium sublimation pumps to achieve a guaranteed base pressure of < 1x10⁻¹⁰ mbar. The high backing pressures of turbomolecular drag pumps simplify user-operation, whilst standard rotary-type backing pumps speed up system pump-down. Pumping options are also available for more specialist environments, including for example, oilfree (scroll backing pumps) and for in-situ aggressive gas dosing.
MULTIPROBE Chamber Modularity

Analysis

The analysis chamber houses various spectroscopy techniques, including XPS, ISS, UPS, AES/ SAM, SEM, etc. Alternative analysis chambers for dedicated applications such as Mono-XPS, ARUPS, HREELS and Low Temperature SPM are also available.

Microscopy

The Scanning Probe Microscope (SPM) is housed in its own dedicated chamber, bolted directly onto the analysis chamber. This enables easy access and simultaneous operation of other analysis techniques. The chamber has suitable viewports for ideal observation of the tip/sample coarse approach with a CCD camera. The VT SPM bolt-on chamber is also compatible with in-situ evaporation from below. An optional chamber extension can house a Photon Electron Emission Microscope (PEEM) between the analysis and microscopy chambers. This has ports for excitation sources and sample transfer. The design is straightforward and allows rapid sample exchange between the analysis chamber, PEEM and SPM. Separate pumping configurations are available as an option.
Preparation

A selection of standard preparation chambers provide in-situ preparation facilities. These range from standard sample preparation techniques and thin film growth, sputtering and annealing, offered by the compact MULTIPROBE P Chamber to advanced in-situ characterisation using LEED or RHEED and analysis options available with the XP and RM versions. The MULTIPROBE RM has a research MBE chamber that allows for up to five evaporation sources on a cluster flange, a RHEED system and a LN$_2$ cooling shroud. Custom designs are also possible, and many non-standard facilities have already been built, including reaction chambers, laser ablation chambers, cleaving stations, vacuum suitcases, to name just a few.
Easy & Safe Sample Transfer

All MULTIPROBE systems feature a common sample transfer and manipulation concept using sample manipulators (with integrated sample heating/cooling options), transfer rods (with transfer head providing a positive locking mechanism for complete sample protection) and storage carousels. This ensures a safe and reliable transfer between all experimental stations even within extended multi-chamber systems.

Sample Plates

The standard design of the Omicron sample plates and tip holders ensure complete compatibility with the sample and transfer systems of existing systems. Standard sample plates are manufactured in various materials including stainless steel, tantalum and molybdenum. To enable the preparation of semiconductors, plates with facilities for direct current heating are available.

Specially designed sample plates cater for PEEM, and for optimum drift-compensation in variable temperature applications. A selection of the available sample plates is shown above.
Philosophy

MULTIPROBE at a glance:
- Modular and compact design
- More than 30 different experimental techniques
- SPM, SEM, SAM, electron spectroscopy & thin film growth
- More than 1000 systems installed world-wide
- Designed and tailored to the customer's wishes and requirements

The MULTIPROBE Compact PEEM (3) is a surface analysis UHV system designed for high resolution PEEM work in combination with LEED and SPM. It also offers sample sputtering, heating, or thin film evaporation.

The MULTIPROBE MXPS (4) offers an alternative analysis module compatible with an x-ray monochromator. It fits exactly into the modularity of the MULTIPROBE concept and is available in the same P, XP, and RM variants.
How to contact us

Headquarters:
Omicron NanoTechnology GmbH
Limburger Str. 75
65232 Taunusstein, Germany
Tel. +49 (0) 61 28 / 987 - 0
Fax +49 (0) 61 28 / 987 - 185
Web: www.omicron.de
e-mail: info@omicron.oxinst.com

We have agents and partners worldwide – please check our website to find your nearest contact.

Omicron NanoTechnology is part of the Oxford Instruments Group. For more information:
www.oxford-instruments.com or just send us an e-mail: info.plc@oxinst.com

The MULTIPROBE Family

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<th>System</th>
<th>Description</th>
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<td>SPM PROBE</td>
<td>Compact UHV system dedicated for SPM applications</td>
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<tr>
<td>MULTIPROBE COMPACT</td>
<td>Cost-effective system for multi-technique surface science</td>
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<tr>
<td>MULTIPROBE Compact PEEM</td>
<td>Dedicated system for high resolution PEEM work</td>
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<tr>
<td>MULTIPROBE S</td>
<td>Single-chamber multi-technique surface science, UHV SPM, load lock</td>
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<tr>
<td>MULTIPROBE MXPS S, P, XP, RM</td>
<td>Multi-technique surface science, UHV SPM, preparation chamber, load lock and monochromated XPS</td>
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Guaranteed Specifications:

- Vacuum achievable: < 1x10^-10 mbar
- Maximum allowable bakeout temperature: 200°C with Viton sealed valves open
  This maximal allowed bakeout temperature may need to be reduced in accordance with the manual of the bolt on component.
- Maximum temperature achievable with resistive sample heater (standard manipulator): > 1150 K
- Minimum temperature achievable with liquid nitrogen cooling (optional for standard manipulator): 140 K at heater base
- Temperatures achievable with LHe cooled manipulator (optional): 50 K to 800 K
- Magnetic field at chamber centre:
  - Mu-metal chamber (MULTIPROBE S) < 25 mGauss (typically 5 mGauss)
  - Mu-metal chamber (MULTIPROBE COMPACT) < 25 mGauss (typically 20 mGauss)

Note: All P, XP, RM variants of MULTIPROBE systems are suitable for thin film deposition.