NEWSFLYER SPRING 2020

scientaomicron

Scienta Omicron Acquires Sigma Technology

Scienta Omicron continues our investment in the Success of the Scientist through the acquisition of the Sigma Surface Science SPM and XPS business. Experts from both businesses will now join together to form one great and industry leading team under the Scienta Omicron roof.

In the recent years, Sigma Surface Science has invested significantly into innovative new lines of SPM and XPS products. These, together with the proven Scienta Omicron products, represent a world-class range of UHV surface science instrumentation and will be offered and serviced through the global Scienta Omicron Sales and Services organisation. Jointly, we remain devoted to providing even more new products to our customers and to breaking new barriers within the world of surface science. We look forward to an exciting joint future and hope to further gain your trust in us and our technologies.

Products from Scienta Omicron are an investment in Nobel Prize technologies!

POLAR STM Lab

Compact and Stable at low temperature with B-Field.

The heart of the multi-application POLAR SPM is the TRIBUS SPM head, integrated into a compact bath cryostat employing a spring suspension and eddy current damping system for optimum mechanical decoupling.

The TRIBUS SPM has a 3D motor for tip and sample navigation, is extremely mechanically stable and offers numerous access ports for optical observation, in-situ sample, probe exchange and evaporation. The TRIBUS SPM offers a very low relative drift between sample and measurement probe. Together with the long hold time (>200 h) and the optional magnetic field (± 5 T) the TRIBUS SPM offers the best conditions for long term experiments such as IETS, SP-STM, force spectroscopy, manipulation or STS.

Up to 10 additional electrical contacts to the sample extend the range of possible measurement modes. The proven Omicron sample plate design ensures compatibility with existing SPM instrumentation and transfer systems.

- **STM, QPlus®-AFM & Spectroscopy**
- **Excellent SPM Stability**
- **Minimum Temperature: T < 5 K**
- **Helium Holding Time: > 200 h**
- **Vertical Magnetic Field: B = ± 5 T**

ASPECT Dynamics with **NEO controller**

Time Resolved Quantitative Analysis.

The high-end multipurpose analyser ASPECT is optimised for the highest sensitivity in electron spectroscopy. It combines an unsurpassed count rate with new controller technology to allow for advanced XPS studies.

The electron optical lens modes are well balanced to combine transmission and energy resolution in high performance XPS applications, providing fastest survey spectra (<2 sec, ΔE<1.5 eV).

ASPECT with NEO speeds up conventional XPS analysis and enables new approaches to quantitative, reliable, and easy to use acquisition.

- **Highest Count Rate**
- **Snap Shot Acquisition**
- **Long Life Detector**
- **Fast Switching Electronics**

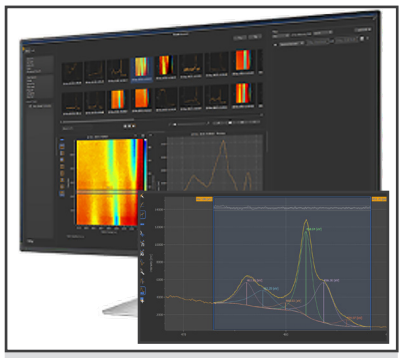
INFINITY SPM Lab

Unlimited time for SPM experiments below 10 K.

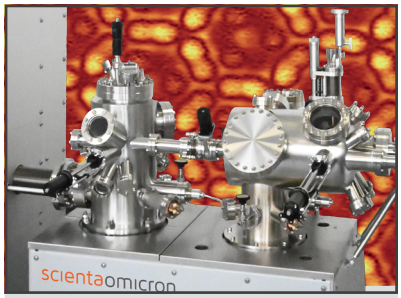
The new INFINITY UHV SPM is a low-temperature SPM for high-resolution STM, QPlus® AFM, and spectroscopy experiments. A pulse tube cooler is employed to cool the UHV SPM to a temperature below 10 K. Thus, the handling of liquid helium or liquid nitrogen is no longer necessary, making the use of the instrument simpler and safer. For optimum mechanical decoupling, the SPM is mounted in a dedicated UHV chamber with ports for sample transfer, optical access and evaporators. To reduce noise levels, the pulse tube cooler is placed in a separate high vacuum chamber. The unique two-chamber design of the INFINITY SPM is the key to pm stability in a temperature range from 10 K to 420 K.

- **"INFINITE" Measurement Time**
- **Only Power & Water Instrument Cooling: No Handling of Cryogenic Liquids**
- **User Friendly: No Filling/Refilling of Cryostats & No Blockages**
- **Quiet Working Environment**

POLAR STM Lab



ASPECT Analyser with **NEO Controller**

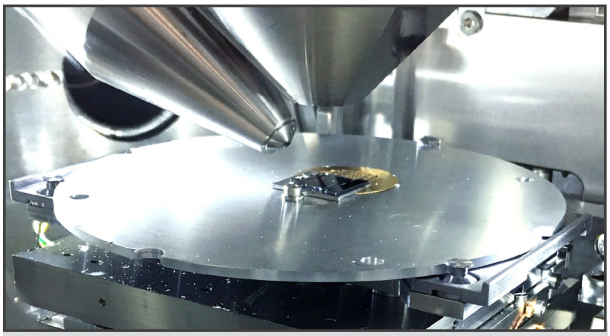


INFINITY SPM Lab

NanoScan Lab for 4“ Wafers

A New Module for UHV SEM and UHV FIB

The capabilities of the NanoCluster tool operated by the Peter Grünberg Institute and the RWTH Aachen were recently expanded with Scienta Omicron’s new NanoScan Lab. The NanoScan Lab combines high-resolution secondary electron microscopy (SEM) and focused ion beam milling (FIB) in a UHV environment. The original 14 UHV modules of this Materials Innovation Platform were installed in the Helmholtz Nanoelectronic Facility (HNF) by Scienta Omicron in 2014 for research on materials, structures, and devices for quantum computing and semiconductor technology.



NanoScan Lab with 5-axis NanoScan sample stage for 4“ wafers, UHV Gemini SEM column and Orsay’s COBRA FIB column.

The design and implementation were a challenging project due to the existing vibrational environment and the high-resolution performance required. Of key importance was creating a design which achieved optimal mechanical stability without compromising easy transfer of the 4“ wafers. The solution was a carefully designed frame and vibration isolation system with our specialized sample stage.

Our motorized, goniometer-mounted 5-axis sample stage supports optimal SEM and FIB performance under true UHV conditions. One key feature of this motorized stage design is an azimuthal rotation of ±180° enabling choice of the FIB’s incidence angle relative to any preferred axis on the sample. Sample tilt up to 55° corresponds to the normal incidence of the FIB onto the sample, optimizing performance. This requirement forced the working distance of the Gemini to increase. But even with the design complexity, the UHV Gemini SEM column achieved an ultimate resolution of <5 nm, and the Orsay Physics COBRA FIB column demonstrated resolution <20 nm.

The HNF researchers will be using their new NanoScan Lab (and their new Large Sample SPM) for the production and characterization of Josephson contacts with structure sizes on the order of 10-50 nm.

Worldwide Service and Support

Find what You need on our New Website!

Scienta Omicron’s Service Team includes 25+ experienced engineers who collectively have experience spanning the past 30 years of UHV scientific innovation, techniques, and processes. This group is the largest and most experienced Services Team in our industry. We are continuously investing to grow our team in size, capability and geographic location. Our global reach ensures we are close to our customers and are able to provide rapid responses via phone, email or on-site, in our customers’ native languages.

At Scienta Omicron we encourage our customers to communicate and interact directly with our Service Team to inform us of any requirements you have. We also keep our service engineers or application scientists on call so we are ready to discuss your needs. Our trained specialists are in constant communication with our manufacturing, engineering, and R&D departments to escalate service issues and keep abreast of the latest product developments.

To maximise the performance and output of our instruments we also offer a variety of training options, from basic operational training, to advanced application programs. Please contact your local Scienta Omicron service representative for details on trainings suitable for your research program.

On our website you can also find a searchable catalogue of spare parts and upgrade information for our large range of instruments. This catalogue is regularly updated with the latest options and part details. You can also use the Contact Form on our website and a service team member will be in touch to see how we can best assist you or answer questions. Our goal is to help make your research program a success!

The Scienta Omicron Service Team, happy and ready to assist our customers.

Installed at University of Notre Dame

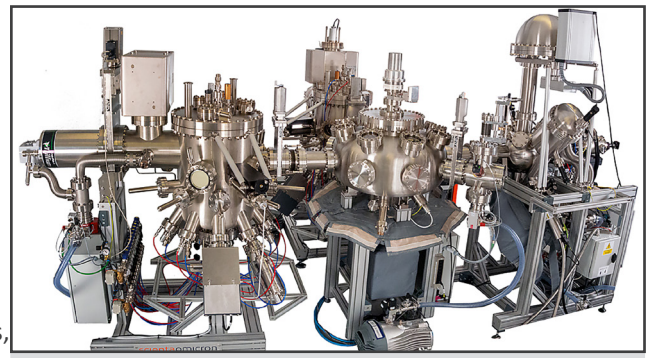
A New Materials Innovation Platform (MIP) combining MBE, ALD and XPS

The group's multidisciplinary research focuses on the growth, characterization, and device physics of quantum and semiconductor materials for novel devices and applications.

Their approach utilises advanced molecular beam epitaxy techniques, selective area atomic layer deposition, and highly developed materials characterisation to fundamentally understand the nucleation and growth process, material nanostructure, chemical bonding, and experimentally determined band structure. They then correlate those findings with advanced electrical transport and magnetic measurements from devices that they fabricate to take full advantage of the novel properties of the materials and heterostructures that are created. Their current research interests include semiconductor defects for quantum communication, topologically protected transport in semiconductors and metals, magnetic properties in 2D materials, and back-end-of-line materials and device integration.

The MIP system consists of multiple modules:

- **EVO-50 MBE for Oxides - 2" wafer**
- **EVO-50 MBE for TMDC - 2" wafer**
- **Prototype small flag sample ALD**
- **XPS Lab - 2" wafer compatible**
- **Radial Distribution Chamber**



The **MIP system** at the University of Notre Dame (USA), group of Prof. Christopher Hinkle, hinklelab.nd.edu
This MIP system supports the group's approach, as it allows material growth and characterization in an ultraclean environment. Growth processes and their influence on chemical states can be investigated via X-ray photoelectron spectroscopy (XPS) without exposing the samples to air after their growth in one of the molecular beam epitaxy (MBE) systems or in the atomic layer deposition (ALD) chamber. Additional information can be gathered by the analysis of UPS spectra, like the determination of the work function.

11 eV Laser for ARPES Lab

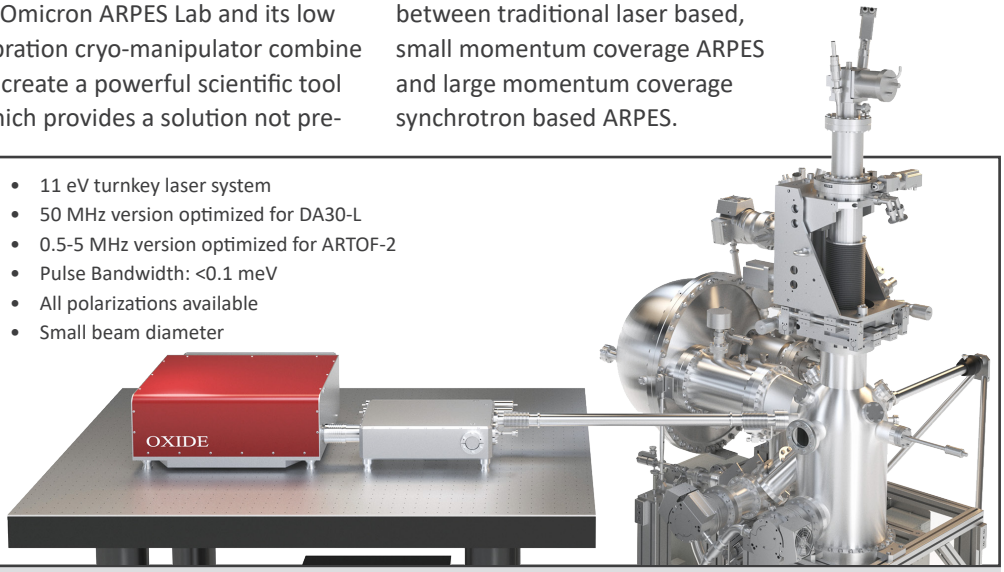
The Photon Source for Ultra-High-Resolution Measurements

Scienta Omicron is proud to introduce new turnkey 11 eV laser technology for the ARPES product portfolio. The availability of this cutting edge, field proven light source is possible through a collaboration with Oxide Corporation of Japan and gives scientists the opportunity to add the 11 eV laser light source as part of new ARPES Lab systems or as an upgrade to existing ARPES setups.

The narrow bandwidth of the laser in combination with optimized pulse length and high photon energy, yield an ideal photon source for ultra-high resolution ARPES. The easy to use touch screen control gives remote control of parameters such as flux attenuation and polarization.

This source together with the Scienta Omicron ARPES Lab and its low vibration cryo-manipulator combine to create a powerful scientific tool which provides a solution not previously available to bridge the gap between traditional laser based, small momentum coverage ARPES and large momentum coverage synchrotron based ARPES.

- 11 eV turnkey laser system
- 50 MHz version optimized for DA30-L
- 0.5-5 MHz version optimized for ARTOF-2
- Pulse Bandwidth: <0.1 meV
- All polarizations available
- Small beam diameter

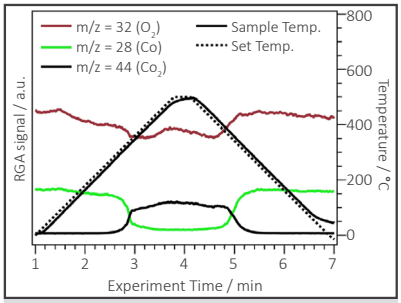


The **ARPES Lab** is equipped with ports in suitable geometry for connecting the 11 eV laser in addition to other photon sources such as the VUV5k.

Bar XPS

Catalytic Reactions under Industrial Conditions

At the Polaris endstation located at the P22 beamline at PETRA III, DESY, it is possible to perform measurements at higher pressures above 1 bar exceeding what was possible with previous APPES instrumentation. Peter Amann from Stockholm University, one of the scientists behind the concept, stated "there is a major interest in using the setup and that measurements so far show interesting effects that are attributed to the elevated pressure the setup is capable of operating at". In fact, the instrument is strongly oversubscribed. The instrument concept, available from Scienta Omicron, was developed by Peter Amann and Anders Nilsson. It is described in ***RSI 90****(2019)103102*. The Bar XPS instrument can be combined with a mass spectrometer mounted on the analyzer.



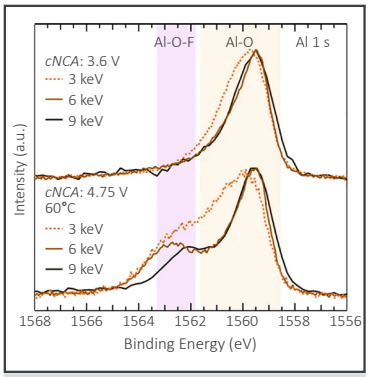
Left axis show mass spectrometry signal of CO (green), O_2 (dark red) and CO_2 (black). Right axis show crystal temperature (dashed black).

This experimental setup opens the possibility to study temperature programmed reactions under realistic pressure conditions while probing the sample in the same area using both XPS and mass spectroscopy, as the example of CO_2 formation on Rh(111) shown in figure.

HAXPES Lab

A Perfect Tool for Battery Research

Aluminum in the bulk of batteries is known to enhance structural and thermal stability but little is known regarding how its benefits might extend to the surface layer. To acquire further insight into aluminum-based coatings, Piper et al. studied the influence of aluminum at the cathode electrolyte interface (CEI) using HAXPES. Ni-rich $LiNi_{0.8}Co_{0.2-y}AlyO_2$ (0 %, 5 %, or 20 % Al) layered oxide cathodes were used in this study to identify the evolution of aluminum species with charging. The 9 keV data presented in ***Sci Rep 9****, 17720 (2019)*, was measured using the HAXPES Lab and provided insight into the role of aluminum in passivating against metal dissolution. To facilitate battery research, the Scienta Omicron HAXPES Lab has a range of options including a sample holder capable of applying a bias to the sample enabling in operando studies. In addition, the Lab can be equipped with a glove box for easy and safe handling of battery samples.



HAXPES on NCA electrodes measured using 3, 6, and 9 keV excitation energy. Electrodes where charged to 3.6 V at RT, and to 4.75 V and held at 4.75 V for 10 hrs at 60 °C using the LiPF6 salt. The 9 keV measurements were collected **HAXPES Lab**

Scienta Omicron New Website

www.scientaomicron.com

The Scienta Omicron Marketing Team is proud to announce the launch of our brand new and freshly designed website! The website launched on the 17th of January 2020.

Goals of the website re-design:

1. **Easy and intuitive website navigation**
2. **Useful search and filtering options**
3. **Enhance ability to communicate with customers and sales**
4. **Enhance brand awareness**
5. **Showcase customer's results and references**
6. **Search Engine Optimised (SEO) and mobile friendly**
7. **Fast loading times across all devices and geographical regions**

The website has been developed to have clear navigation and usability. It quickly points you towards important information including, featured content, conference information, products categories, and information about Scienta Omicron.

A noteworthy new feature on our website are four new 'Finders'. Our 'Finders' allow you drill down within our website to find the information you need. Our 'Technology Finder' allows you to easily find which of our 85 technologies with best suit your research needs. Our 'Services Finder' helps you find which of our 500 spare parts suits your system. With our 'Reference Finder' you can explore Scienta Omicron systems that are already in-use around the world. And our 'Result Finder' allows you to explore research publications that feature our products.

The new website is data-driven and will be continuously updated with helpful product and spare part information, services and service upgrades, latest results and publications, new references, newsletters, company announcements, and customer successes.

TechnologyFinder
ResultFinder

The site also links to our social media platforms, including LinkedIn, Twitter and Facebook. We would like to connect with you there as well!

We hope you find the new website easy to use. If you have feedback, please contact us at: new.website.feedback@scientaomicron.com

Thank you to our Product Managers, Services Team and Global Sales Team for your valuable contribution to our new website.