

# Tuesday Morning, November 11, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-TuM

## Exhibitor Technology Spotlight Session

Moderator: Chris Moffitt, Kratos Analytical Limited, UK

10:20am **EW-TuM8 High Speed Water Vapor Cryopumps: Increasing Tool Throughput and Process Yield with Polycold PFC and MaxCool Products**, *C. Rebecchi, Kevin Flynn*, Brooks Automation, Inc., Polycold

Water vapor is the primary reason for slow pumpdown from crossover to ultra high vacuum in most vacuum systems. At chamber pressures near crossover, water vapor easily accounts for the majority of a vacuum system's gas load. In addition, water vapor and dissociated oxygen are often unwanted contaminants that can physically or chemically reduce product quality and yield in vacuum deposition processes. Since water vapor is a polar molecule, it easily adheres to chamber surfaces and desorbs slowly. High speed water vapor pumping is especially critical in large-scale commercial vacuum processes, where maximum tool throughput, product quality, and process repeatability are most valued. When ambient chamber temperatures allow, the most effective method to increase the overall water vapor pumping speed in a vacuum system is to install a large cryosurface directly inside the vacuum process chamber. In this location, the cryosurface will add effective supplemental water vapor pumping that is not diminished by vacuum conductance limitations such as high vacuum ports or valves. Polycold PFC and MaxCool products feature extremely fast cryosurface cooldown and defrost capabilities, which allow cryosurface placement directly inside a vacuum process chamber for optimum high speed water vapor pumping. Polycold PFC and MaxCool products also feature both high cooling capacities and low-temperature performance able to cool very large cryosurfaces for very high speed water vapor pumping. The industry-leading Polycold MaxCool 2500L cryochiller features unbeaten low temperature performance for >100,000 l/s water vapor pumping down to 2E-9 torr water vapor partial pressure and >200,000 l/s of water vapor pumping down to 4E-8 torr water vapor partial pressure.

10:40am **EW-TuM9 Stylus Profilometry – Bruker's DektakXTL delivers Innovation in Flexibility and Ease of Use**, *Eric Rufe*, Bruker

Bruker will present DektakXTL large area stylus profilometry system and advantages of new automated scanning and alignment capabilities, as well as simplified quick acquisition tools for fastest time to data supporting applications in a range of industries including but not limited to flexible electronics, display and touch screen manufacture.

# Tuesday Lunch, November 11, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-TuL

## Exhibitor Technology Spotlight Session

**Moderator:** Chris Moffitt, Kratos Analytical Limited, UK

12:40pm **EW-TuL2 New Developments in Surface Analysis from Thermo Fisher Scientific**, *Tim Nunney, P. Mack, A.E. Wright, R.G. White, A. Bushell*, Thermo Fisher Scientific, UK

Thermo Scientific offers a broad range of analytical techniques for materials characterisation, including XPS, Raman spectroscopy, FTIR spectroscopy, EDS, WDS and EBSD. In this presentation we will discuss our latest developments in instrumentation and software to extend our surface analysis capabilities.

1:00pm **EW-TuL3 What's New from Physical Electronics**, *Scott Bryan, J.F. Moulder*, Physical Electronics Inc.

The latest innovations in our XPS, AES, and TOF-SIMS products will be presented.

1:20pm **EW-TuL4 Latest Developments and Applications of X-ray Photoelectron Spectroscopy**, *Chris Blomfield*, Kratos Analytical Limited, UK

X-ray Photoelectron Spectroscopy (XPS) is a mature surface analysis technique allowing quantitative surface chemical analysis on a wide range of materials. Recent developments in acquisition and data treatment methodologies have extended the capabilities of the technique. Nanoscale depth information can now routinely be obtained through angle resolved XPS and the data presented in classical depth versus concentration plots. XPS depth profiling techniques employing ion etching which have been used to investigate thin films of inorganic materials can now be extended to a range of organic materials through the introduction of giant gas cluster ion sources. XPS imaging can be used to observe the lateral distribution of different chemical species on the micron scale. New higher energy X-ray sources can increase the capability of laboratory XPS instruments with both extended photon energy range, exciting emission from deeper core levels and increased analysis depth capabilities which have previously only been available at synchrotron light sources. New generation data systems have made the operation and maintenance of XPS instruments routine with automated acquisition and processing workflows increasing the sample throughput and accuracy of measurements. The Axis Supra and ESCApe data system are the latest developments in XPS hardware and software which bring all of the above mentioned capabilities together in a new instrument and software platform, combining ease of use and high throughput with research grade performance and flexibility. The electron optics and underlying technology are an evolution of the well-established Axis spectrometers from Kratos Analytical. This presentation will illustrate the capabilities of the Axis Supra with a range of the latest applications from a diverse range of materials systems.

1:40pm **EW-TuL5 EW Bruker2 Abstract**, *Corporation Bruker*, Bruker Corporation

# Tuesday Afternoon, November 11, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-TuA

## Exhibitor Technology Spotlight Session

**Moderator:** Chris Moffitt, Kratos Analytical Limited, UK

4:00pm EW-TuA6 **What's New in AFM for Nanoelectrical and Nanomechanical Characterization**, *Keith Jones*, Oxford Instruments Asylum Research

Oxford Instruments Asylum Research will present the latest AFM innovations for nanoelectrical characterization that provide new information that was inaccessible by previous techniques:

- Scanning Microwave Impedance Microscopy (sMIM) for conductivity and permittivity mapping on insulators, semiconductors and conductors
- Nanoscale time dependent dielectric breakdown (NanoTDDB) with the spatial resolution of an AFM tip
- Dual Gain CAFM to measure current from 1 pA to 10  $\mu$ A with sub-pA sensitivity on samples with widely varying conductivity

We'll also present an overview and the latest results of AFM mapping modes that calculate both the elastic and loss modulus:

- AM-FM Viscoelastic Mapping Mode for quantitative nanomechanics with the resolution, ease of use and speed of tapping mode
- Contact Resonance Viscoelastic Mapping Mode for quantitative nanomechanics on materials from 1 GPa to 100's Gpa

# Wednesday Morning, November 12, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-WeM

## Exhibitor Technology Spotlight Session

**Moderator:** Chris Moffitt, Kratos Analytical Limited, UK

10:20am **EW-WeM8 Product Advancements to Reduce Semiconductor Manufacturing Contamination**, *J. Legare, Mark Heller*, Dupont™ Kalrez® and Vespel

Sealing materials can degrade in harsh semiconductor manufacturing processes. Advancements in elastomeric sealing materials and their components help reduce the risk of contamination from sealing materials. This presentation will highlight the latest DuPont Kalrez® sealing products and their test results.

10:40am **EW-WeM9 Wet Cell II for Analysis at the Liquid Vacuum Interface**, *Junhang Luo, Rodek*, SPI Supplies

The liquid interfaces chemistry plays a key role in environmental, biological, and industrial processes. However, in-situ analyzing liquid surface is an extreme challenge because of the rapid liquid evaporation especially in vacuum. Wet Cell II makes it possible and simple for scientists and researchers to directly analysis of liquids at the molecular level in a vacuum environment with minor cost. As a lab-on-a-chip device, Wet Cell II can be straightforwardly adaptable to many different analytical platforms, including scanning electron microscopy (SEM) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). Wet Cell II only consumes a few drops of liquid and requires little or no sample preparation. Typical applications include microbiology, liquid surface chemistry, drug delivery & reaction, and energy storage, etc.

# Wednesday Lunch, November 12, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-WeL

## Exhibitor Technology Spotlight Session

Moderator: Chris Moffitt, Kratos Analytical Limited, UK

12:40pm **EW-WeL2 An Auger Electron Analyzer System for *In Situ* Growth Monitoring.** *W.Laws Calley III, P.G. Staib*, Staib Instruments, Inc.

The Auger Probe is a specially designed electron analyzer engineered for in situ growth monitoring [1]. To avoid shadowing a growing surface, the Probe is designed to operate at extended working distances (tested between 50mm to 82mm) with a tapered, small diameter tip. The Probe can utilize a grazing incidence RHEED gun or a near normal incidence electron gun. Figure 1 shows a typical Probe configuration in an MBE system.

AES is a surface sensitive technique capable of detecting nearly all elements. The Probe has detected low-Z elements like Li, figure 2, as well as high-Z elements like Dy [2], figure 3, during real time deposition of the respective element.

The Probe has been implemented in a wide variety of growths environments, from more traditional MBE III-V growths, to III-Nitrides and Oxides, figure 4, as-well-as metal alloy growths.

The Probe has proven reliable in all the tested growth environments, including systems with Li, O, Cl, Ga, As, and Sb. It has not failed in any tested growth environment after hundred of hours of exposure during growth. It has not been shown to interfere with any growth process that it has been operated.

The Probe is easy to operate, requiring simplified alignment when compared to traditional AES. Coupled with automated data acquisition software, it is easy to implement in real time growth monitoring.

The Probe has been used to detect and identify several contaminants in growth environments including. C, O, and Cl. It has also been used to monitor the oxide removal from substrates prior to growth.

The Probe has been used to monitor the growing surfaces in all of the previously mentioned growth environments. This real time monitoring of growing films allows the user to construct an AES growth profile of the grown film.

The Probe provides real time N(E) auger spectra enabling quantification of the Auger data. This allows the user to track the elemental concentration throughout the growth.

The Probe has been used in a wide variety of growths environments. The Probe has not failed in any of the environments in which it has been installed. The Probe can detect elements as light as Li to heavy elements through the Lanthanide system. In addition to AES, the analyzer provides REELS spectra of the distribution of characteristic energy losses [3]. Due to its robust and unique design, the Probe can be used in a variety of growth environments to provide real time elemental analysis during growth.

[1] P. G. Staib, J. Vac. Sci. Technol. B 29, (2011).

[2] W. Laws Calley, et al., J. Vac. Sci. Technol. B 31, (2013).

[3] P. G. Staib, at this conference. Abstract #5115

1:00pm **EW-WeL3 Safe and Efficient - Dry Bed Exhaust Gas Abatement of Toxic Gases I.** *Sam Yee*, CS Clean Systems Inc.

The NOVAPURE® series offers a safe, efficient and reliable solution for treatment of hazardous process gases and by-products.

This unique system uses chemisorptive granulate technology to treat process gases in a negative pressure environment ensuring only inbound flows. Continuous gas monitoring assures total point-of-use gas treatment below TLV levels. In the event of a power outage, the NOVAPURE system will continue to treat the inflows.

The built-in 90% depletion feature provides warning of breakthrough when the granulate is 90% consumed. The remaining capacity allows the current process to run-to-finish and time to schedule a shutdown for canister replacement.

Chemisorptive technology provides irreversible reactions with process gases and their byproducts, forming non-volatile solids. The spent canister can be easily and safely disposed of or incinerated. Air pollution regulations, employee health concerns, and growing awareness of toxic agents from semiconductor processes demand increased improvements in exhaust gas conditioning.

The NOVAPURE® Dry Scrubber reduces the hazards associated with flammable, toxic or corrosive gases and vapors.

NOVAPURE® effluent gas scrubbers offer an extremely safe and efficient way to treat toxic and corrosive gases resulting from hazard processes. This scrubber is a technologically advanced dry chemical scrubber containing approximately 32 or 37 gallons of scrubbing media. The scrubber is suitable for use in production and general laboratory environments. Operating passively at ambient temperature, chemical resins in the canister react on contact with process gases and by-products, converting them to non-volatile inorganic solids.

Applications include: Ion Implant, Etch, ALD, CVD, III-V, and MOCVD. Flow limit is 240slpm. The unit is equipped with built in bypass, end point detector.

1:20pm **EW-WeL4 The Workstation For Your 2D Characterization Needs - The First Low Temperature MultiProbe SPM-NSOM System Integrated with Raman.** *David Lewis*, Nanonics Imaging Ltd.

The Nanonics CryoView MP is the ideal SPM platform for studying mechanical, optical, and electrical nanoscale properties of 2D materials at low temperature. Materials such as graphene, hexagonal boron nitride (h-BN), dichalcogenides (e.g.) MoS<sub>2</sub>, etc. The CryoView MP is uniquely suited to conduct studies in dynamics, photoconductivity, electrical conductivity, and other phenomenon of such materials. Very sensitive and stable tip- sample interaction control through the tuning fork feedback mechanism allows for high resolution SPM measurements. The open optical access allows for a variety of optical integrations including near-field, Raman, TERS and fluorescence measurements. Multiple probes allows for a variety of electrical measurements including MFM, EFM, KPM and thermal measurements. The CryoView MP opens up many new possibilities for exciting research in your 2D materials.

1:40pm **EW-WeL5 Trends and Solutions of Control Electronics for Surface Analysis and Science.** *Jacek Latkowski*, PREVAC sp. z o. o.

Any electronics, magnetic and electrostatic field distortions give rise to unwanted effects, especially in sensitive electron microscopy measurement techniques such as XPS and UPS. The electronics utilised in these techniques require special consideration in order to minimise the influence of such distortions. We will describe, based on practical experience, how important these considerations are.

# Wednesday Afternoon, November 12, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-WeA

## Exhibitor Technology Spotlight Session

**Moderator:** Chris Moffitt, Kratos Analytical Limited, UK

4:00pm **EW-WeA6 FOCUS beyond PEEM and NanoESCA, Dieter Pohlenz, M. Escher, M. Weber, FOCUS GmbH, Germany**

FOCUS is an owner-managed German company situated in Hünstetten close to Wiesbaden. Since its establishment in 1990, FOCUS has been engaged in the field of electron beam evaporation, electron spectroscopy and electron microscopy and in scientific apparatus construction generally. Most recent developed products are the focused VUV-source HIS 14 HD and the universal UHV Ion Source FDG 150. The HIS 14 HD source delivers a spot diameter of 300µm for angle resolved photoemission spectroscopy using technology developed at synchrotron beam lines. We list the mounting requirements and show first ARPES results. The FDG 150 is designed for depth profile analysis in XPS- and Auger Spectroscopy and charge neutralization (ESCA). Further applications are sample cleaning and sensor cleaning in scanning probe microscopy and the use as excitation source for ISS/LEIS analysis. The FERRUM spin polarization detector is the latest FOCUS product for spin analysis which can be combined with state of the art electron spectrometers.

# Thursday Morning, November 13, 2014

## Exhibitor Technology Spotlight

Room: Hall ABC - Session EW-ThM

## Exhibitor Technology Spotlight Session

Moderator: Chris Moffitt, Kratos Analytical Limited, UK

### 10:20am EW-ThM8 An Entirely New Generation of Cold Cathode Gauges, *Martin Wüest*, INFICON Ltd., Liechtenstein

The cold cathode gauge is a robust vacuum gauge used in many applications. INFICON has introduced an entirely new generation of the inverted magnetrons shedding the issues that plagued performance of the past and now allow its use even in domains that have traditionally been occupied by hot ionization gauges. An innovative and patented magnet design produces the first sensor conforming to Semi S2 specifications regarding ultra-low external magnetic stray field. Together with its small dimensions and low magnetic stray field, it can even be used within analytical devices without impact on surrounding instrumentation. First customer data received demonstrates that the gauge lasts approximately four times longer in a process environment than its predecessor. A unique interchangeable dual chamber facilitates maintenance. It takes only moments to exchange the sensor and return it to normal functional performance. Additional significant features will be discussed, as well.

### 10:40am EW-ThM9 Raman Imaging Microscopy Characterization of Carbon Nano Material, *Alex Rzhetskii, M.H. Wall*, Thermo Fisher Scientific

Over the last few years carbon nano materials have been the focus of many investigations due to their unique electronic, mechanical, and chemical, properties. These materials are being investigated as routes towards more efficient batteries, stronger lighter polymer composites, and faster electronics, to name a few. However, it is necessary to solve several challenges regarding quality uniformity and scalability before these applications are fully realized. Raman imaging microscopy offers a means to address these challenges. This presentation will highlight the Thermo Scientific DXRxi Raman imaging microscope and its application to the characterization of carbon nano materials. Specific examples will be discussed that demonstrate the enhanced speed, intuitive operation, and the simultaneous data acquisition/data analysis capabilities of this new Raman imaging microscope. See how highly detailed Raman chemical images gives comprehensive insight into the nature of carbon nano materials.

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