Tuesday Morning, October 29, 2013

Exhibitor Technology Spotlight
Room: Hall A - Session EW-TuM

Exhibitor Technology Spotlight I

Moderator: C. Moffitt, Kratos Analytical Limited, UK

10:00am **EW-TuM7 Nothing to Fret about Fretting**, ***S. Shaffer***, Bruker

Fretting occurs when two materials come in contact with each other under load and are subject to a very low amplitude relative motion, often due to vibration. Usually, the amplitude of the vibration is 50 microns or less. This phenomenon occurs across a wide range of industries, and understanding this wear process, as well as the effectiveness of palliatives is important. In electronic packaging fretting can occur where two contacts mate. In aerospace applications, this process occurs where the turbine vanes dovetail to the rotor disk. In the automotive industry, this can occur in under-the-hood applications like engine mounts. A new UMT drive with a fully programmable stroke length and frequency will be used to demonstrate how materials can be tested to make sure that materials and coatings selected for these types of applications are suitable. The new drive is designed to work in a variety of application-specific environments.

10:20am **EW-TuM8 A New Truly Easy-to-Use Dedicated Infrared Microscope**, *T. Tague*, ***S. Wang***, Bruker

A new stand-alone infrared microscope (Lumos™) has been developed for the rapid analysis of small samples. The new microscope was developed with the intent of providing state-of-the-art microanalysis capabilities with a truly easy-to-use user interface. The visual image quality of the Lumos is excellent so the important first step in the analysis, visualization, is easily accomplished. The Lumos utilizes a unique objective design, where the numerical is low for sample viewing and high for the infrared data collection. This makes it very easy to locate and view the sample without sacrificing infrared performance.

The novel Wizard user interface controls all aspects of the microscope and guides the user through the analysis process. The sample stage, sample focus assembly, condenser, aperture, polarizers, and ATR mode are controlled in the software providing true “point and shoot operation”. ATR microanalysis is accomplished by simply clicking on the area of interest in the software to center it and selecting ATR. Area reflection, transmission, and ATR images are collected by simply drawing the desired analysis and starting the desired acquisition. The image processing software interface provides research quality analysis tools with an intuitive interface.

The Lumos also has a unique ability to readily analyze samples with traditional sampling accessories. A port is provided to attach accessory modules from Bruker’s Alpha FTIR Series. Standard ATR, transmission, reflection, and even gas cell analysis can be readily conducted with the Lumos. Lastly, the Lumos comes with a comprehensive validation package to support any range of validation requirements.

Tuesday Lunch, October 29, 2013

Exhibitor Technology Spotlight
Room: Hall A - Session EW-TuL

Exhibitor Technology Spotlight II
Moderator: C. Moffitt, Kratos Analytical Limited, UK

12:20pm **EW-TuL2 What's New from Physical Electronics**, ***J.F. Moulder***, Physical Electronics Inc.
The latest innovations in our XPS, AES, and TOF-SIMS products will be presented and we will introduce an exciting new instrument at AVS.

12:40pm **EW-TuL3 Next Generation Data System for XPS**, ***C.J. Blomfield***, Kratos Analytical Limited, UK
Analytical instrumentation often has a large number of users with various operational and data processing skill levels. Modern software should allow both the novice and expert user to acquire the data they need while following the appropriate protocols. Although the concept of an expert system for x-ray photoelectron spectroscopy was suggested over a decade ago (Castle and Powell[1]) the implementation of such expert systems is only just being realized.

In this presentation we will introduce a new generation data system which provides data dependent acquisition capability independent of the Users experience. Based on an initial survey spectrum the software is used to define the hardware acquisition parameters appropriate to the results required. Thus the software will provide the User with element identification and acquisition parameters appropriate to the requirements of either trace element detection or elemental/chemical state identification.

By allowing the software to determine the appropriate acquisition parameters for specific applications based on easy to define parameters such as signal to noise ratio the precision and accuracy of quantification from photoelectron spectra can be increased. This also ensures that the data acquired in a multiuser, non-expert environment is valid. Furthermore in line with protocols required for regulatory environments full traceability from raw data to quantified spectra is incorporated into the new data acquisition and processing software.

Reference

1. JE Castle, CJ Powell, SIA, Vol 35, Issue 3 p25-237

1:00pm **EW-TuL4 New Developments in Materials Characterization from Thermo Fisher Scientific**, *A.E. Wright*, ***T.S. Nunney***, *P. Mack*, Thermo Fisher Scientific, UK, *B. Strohmeier*, Thermo Fisher Scientific
Surface and subsurface structure and chemistry are crucial to the successful production and operation of innumerable devices, materials and coatings. Thermo Scientific offers a broad range of analytical techniques for the materials characterisation, including XPS, Raman, FTIR, EDS and EBSD. In this presentation we will discuss our latest developments in software and instrumentation.

1:20pm **EW-TuL5 Recent Instrument Development for State-of-the-Art Photoelectron Spectroscopy**, ***H. Bergersen***, VG Scienta AB, Sweden
For several decades, VG Scienta has been the leading developer of instrumentation for Photoelectron Spectroscopy, with emphasis on ARPES, HAXPES and APPES. In our presentation we will describe the latest developments within each field along with recent scientific results.

1:40pm **EW-TuL6 Innovative Thin Film Deposition Tools for R&D from Blue Wave Semiconductors**, ***R.D. Vispute***, Blue Wave Semiconductors
Unique properties of new materials are exploited in emerging applications including electronics, optical, biological nanoelectronics, and advanced electromechanical systems. Despite the extraordinary efforts in developing these materials, an efficient and compact single chamber vacuum deposition system capable of addressing needs of all thin films and nanomaterials is not available at a commercial level. For this reason, Blue Wave Semiconductors has developed an integrated physical and chemical vapor deposition tool for synthesizing all carbon based thin films and nanostructures including diamond, nanodiamond, CNTs and graphene, metals, oxides, nitride, carbide thin films and their nanostructures. We have successfully designed and developed chemical and physical vapor deposition processes in a single processing chamber to efficiently deposit a variety of advanced thin film materials and nanostructures. We will present our systematic study on identification of various processing parameters on growth of nanostructures of carbon materials. Some examples of nanodiamond and graphene films synthesized using exploratory tool developed for carbon materials for electronics will be highlighted. Blue Wave Semiconductors, Inc. is a global supplier of advanced thin film and nanomaterial deposition systems and tools. The company manufactures reliable physical vapor deposition, chemical vapor deposition and integrated custom deposition systems involving laser, DC, rf plasma, sputtering, hot filament, and electron beam. Its thin film deposition systems combine multidisciplinary designs and processes involving filament generated atomic hydrogen, laser induced plasma, with chemical processes. Blue Wave's deposition tools are excellent for synthesis of novel coating materials of composite nanostructural carbides, oxides, nitrides, and carbon materials such as diamond, graphene, and CNTs. Its deposition equipment products are designed primarily for universities, research centers and leading national laboratories around the world. It also provides prototype runs of a variety of thin film coatings and device fabrication to its electronic thin film R&D customers.

Exhibitor Technology Spotlight
Room: Hall A - Session EW-TuA

Exhibitor Technology Spotlight III
Moderator: C. Moffitt, Kratos Analytical Limited, UK

3:20pm **EW-TuA5 New Developments in Thin Film Technology**, ***D. Bingaman***, Kurt J. Lesker Company
In this spotlight the Kurt J. Lesker Company® will update the industry on some of its new thin film deposition solutions from our Process Equipment Division.

3:40pm **EW-TuA6 Picolitre Dosing of Proteins onto Biomaterials Microarrays to Monitor Cell Response in a Combinatorial Assay**, ***C. Dufresne***, Scienion US, Inc., *M. Hammad, M.R. Alexander*, University of Nottingham, UK
A high throughput model of protein pre-adsorption on biomaterials for control of cell adhesion and proliferation is being investigated using Scienion's non-contact low volume dispensing technology. Valuable proteins combinations (31 in triplicate) were piezo-dispensed and pre-adsorbed onto microarray spots representing seven biomaterials. Cell density correlates with the surface chemistry of the protein pre-adsorbed polymer spots as acquired by ToF-SIMS. It is only possible to rapidly produce and assess this many protein adsorption combinations with a high throughput platform combined with high throughput surface characterization. Details of this technology will be presented.

Exhibitor Technology Spotlight
Room: Hall A - Session EW-WeM

Exhibitor Technology Spotlight IV
Moderator: C. Moffitt, Kratos Analytical Limited, UK

10:00am **EW-WeM7 PREVAC's Solution for Scientific Software Needs**, ***M. Czarnecki***, *J. Latkowski*, PREVAC sp. z o.o., Poland

Time used to integrate scientific equipment and get the various compnents of a complex system operating smoothly is time wasted. PREVAC has tackled this problem with a softwarre platform that actually helps accelerate the scientific research process. RAPID SE (Rapid Scientific Environment) is a complete and versatile software environment which was developed after many year's experience of listening to and working with research labs worldwide. It is an intuitive, user-friendly environment which allows complex and interdependent scientific equipment to be operated from a single platform. Every aspect of a complete system, from pump-down and vent routines, sample manipulation, process recipe steps and data acquisition can be quickly and intuitively managed from the core RAPID SE platform. Rapid provides the following advantages: • Real time synchronous data acquisition • Fast, real time chart data preview • Process automation with safety guard • Visual system state presentation • Process creation and control • Extendable and reconfigurable during runtime (additional modules, connections, data presentations, etc.) • Full system control from Graphical User Interface • Fully customizable user interface • Password protected user profiles • Number of configurable working mode (eg. admin, scientist, student) • Multi-screen support • Graphical system state presentation • Full system events log for system maintain and quick problem detection • Email or SMS message notification on system events and errors • Export collected data to various formats (real time data, archived data) • PLC integration (option) Examples of use: Data acquisition systems (data acquisition, system/de- vices control, failure detection and log) • Deposition systems (complete process and vacuum control, data acquisition, failure detection and log) • TDS (Thermal Desorption Spectroscopy Process Control) • UMS (Universal Mass Spectrometer) • VPC(Vacuum Pressure Control) • ASTS (Automation of The Sample Transfer System) • Vacuum Conditions Simulators

10:20am **EW-WeM8 Integrated AFM-Raman – Connecting Performance & Flexibility to Ease of Use & Reliability**, *M. Wall*, ***M. Ibrahim***, Thermo Fisher Scientific

As the largest Raman instrument supplier in the world, Thermo Fisher Scientific is committed to continued innovations in Raman microscopy. The Thermo Scientific™ DXR™ family of Raman systems is known for making research performance Raman more accessible and useable by a wider number of users. **This year we extend our solutions to materials science research to include an integrated AFM-Raman solution that allows multifaceted analysis of advanced materials with nanoscale resolution**. Join us to briefly hear about instrument solutions for analysis of graphene and other advanced materials including Raman, co-localized Raman AFM, and TERS. Whether you're in academic or government research or an analytical laboratory in industry the DXR family can get you there faster.

Wednesday Lunch, October 30, 2013

Exhibitor Technology Spotlight
Room: Hall A - Session EW-WeL

Exhibitor Technology Spotlight V
Moderator: C. Moffitt, Kratos Analytical Limited, UK

12:20pm **EW-WeL2 High-Sensitivity, Quadrupole Mass Spectrometry Method for Measuring Water Vapour Transmission Rate (WVTR) of Barrier Membranes to 10^{-6} g/m^2/Day using Deuterium Oxide (D_2O)**, ***S. Swann***, *M.P. Dobson, N. Singh*, VGScienta Ltd., UK

We present a vacuum-enabled measurement technique and equipment utilising mass spectrometry and deuterium oxide combined with a novel calibration method, enabling traceability to national standards. This method incorporated in the VacuTRAN™ instrument allows measurements to 10^{-6} g/m^2/day WVTR and the ability to measure multiple species simultaneously. The sensitivity of the UHV system with respect to residual gases and D_2O proton-exchange reactions are discussed.

12:40pm **EW-WeL3 High Efficiency, High Capacity, and Economical "Point of Use" Gas Abatement**, *S. Yee*, CS Clean Systems Inc., ***D.K. Prasad***, CS Clean Systems, Inc.

Air pollution regulations, employee health concerns, and growing awareness of toxic agents from semiconductor processes demand increased improvements in exhaust gas conditioning. The NOVASAFE® Dry Scrubber reduces the hazards associated with flammable, toxic or corrosive gases and vapors. NOVASAFE® 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 2.5 gallons (9.5 liters) 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. NOVASAFE combines high efficiency and high capacity in a compact, in-situ solution providing compliance with appropriate exhaust gas regulations and protocol NOVASAFE is a passive abatement solution for semiconductor, vent gas, R&D and Lab instruments application. As a zero footprint scrubber, the NOVASAFE can be easily integrated with your vacuum pump system. Effluents are abated with the NOVASAFE to sub-TLV levels from roughing pumps and cryopumps. There are no moving parts. Change-outs are accomplished easily and have minimal impact on operations. With its compact and low impact design, the NOVASAFE is the ultimate uptime and economical abatement solution. Typical applications include; Etch, CVD, Implant, MOCVD, ALD, and advanced processes such as III-V Etch. The majority of semiconductor processes gases can be safely abated, including challenging gases such as; AsH3, SiH4, Cl2, F2, MO`s as examples.

1:00pm **EW-WeL4 AFM and Raman Spectroscopy: Correlated Imaging and TERS**, ***I. Armstrong***, Bruker

The desire to identify materials and their properties to understand complex systems and better engineer their functions has been driving scanning probe microscopies since their inception. Both atomic force microscopy (AFM) and Raman spectroscopy are techniques used to gather information about the surface properties and chemical information of a sample. There are many reasons to combine these two technologies, and this presentation discusses both the complementary information gained from the techniques and how a researcher having access to a combined system can benefit from the additional information available.

1:20pm **EW-WeL5 Can Your AFM Do This—Advanced Characterization with Asylum AFM Accessories**, *A. Labuda, R. Proksch,* ***A. Moshar***, Asylum Research, an Oxford Instruments company

Asylum Research, an Oxford Instruments company, will discuss the performance and results from a variety of AFM accessories used for advanced characterization for MFM, stress and strain measurements, and imaging in fluid. We'll show our Variable Field Module 2 that applies in-plane magnetic fields of more than ±0.8 Tesla (8,000G) and offers ~1G field resolution. Our NanoRack™Stretching Stage applies symmetric tensile or compressive loading to samples about a central area that can be simultaneously observed with the AFM. Finally, we'll discuss the blueDrive™ Photothermal Excitation capability for Cypher™, the highest resolution fast scanning AFM. blueDrive enhances the performance of AC (tapping) mode imaging by providing extremely clean tunes in both air and water.

1:40pm **EW-WeL6 Nanofabrication Below 10nm Using He and Ne Ions**, *D. Elswick,* ***B. Singh***, Carl Zeiss Microscopy

Ion microscopy using helium or neon beams created from a gas field ion source (GFIS) shows great potential and flexibility for many imaging and nanofabrication applications. With helium or neon, sub-10 nm structures can be routinely fabricated in a variety of materials including sensitive materials such as graphene. Additionally, the beam-sample interaction dynamics of helium/neon ion beams offer unique contrast and stunning surface detail at sub 0.5nm lateral resolution.

The helium ion beam introduces a unique opportunity for high precision patterning in graphene. High aspect ratio nanoribbons have been machined down to 5 nm without damage. Due to the nature of imaging with the helium ions, non-destructive imaging of graphene with excellent surface sensitivity can be achieved both before and after patterning. Helium and neon beams have also been used for a diverse range of other nanofabrication applications. Solid state nanopores for DNA sequencing devices with holes down to 3 nm in diameter and aspect ratios greater than 10:1 have been created in a variety of materials. In plasmonic applications, dislocation damage to surrounding structural elements is greatly reduced compared to gallium FIB when using helium or neon, thus allowing work on delicate and sensitive membranous materials. Plasmonic devices with nearly vertical sidewalls have been patterned in films demonstrating machining precision of better than 5 nm. Direct write lithography using commercial resists HSQ and PMMA resulted in line features as narrow as 4 nm. Finally, the use of helium and neon ions beams for circuit edit applications is being developed. Deposition of conducting and insulating materials creates features smaller than those obtained with gallium FIB and with better electrical properties due to the absence of gallium.

A gallery of helium ion microscopy imaging and nanofabrication results will be presented to showcase the capability and performance of this novel microscope.

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Bold page numbers indicate the presenter