Tuesday Morning, October 19, 2010

Exhibitors & Manufacturers Technology Spotlight
Room: Southwest Exhibit Hall - Session EW-TuM

Exhibitors & Manufacturers Technology Spotlight
Moderator: D.J. Surman, Kratos Analytical Inc., R. Langley, Consultant

10:20am **EW-TuM8 Multifrequency Techniques for AFM/SPM**, ***A. Gannepalli***, *R. Proksch,* Asylum Research, *S. Jesse*, ORNL

In multifrequency AFM, as the name suggests, the AFM cantilever is excited at more than one frequency, typically two, but could be more. The motivation is to increase the amount of information on the tip-sample forces that can be measured. When the excitation frequencies coincide with the resonant modes of the cantilever, it is called modal imaging. In harmonic imaging the excitation frequencies are the harmonics of a resonant mode. A different technique called Dual AC Resonance Tracking (DART) uses two excitation frequencies to track the contact resonance of the cantilever in contact resonance applications. A methodology to extract the conservative and dissipative nature of the tip-sample interactions in DART mode will be presented. A new technique called Band Excitation, where the cantilever is excited in a band of frequencies, allows mapping conservative interactions, nonlinearities, and energy dissipation at the nanoscale. The presentation will focus on the technology, instrumentation, and application examples.

Exhibitors & Manufacturers Technology Spotlight
Room: Southwest Exhibit Hall - Session EW-TuL

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Moderator: D.J. Surman, Kratos Analytical Inc., R. Langley, Consultant

12:20pm **EW-TuL2 A Multi-technique Approach to the Characterization of Patterned Polymers Using ESCALAB 250Xi**, ***P. Mack****, R.G. White, A. Wright*, ThermoFisher Scientific, UK

Surface treatment of polymers produces materials that exhibit a wide range of surface compositions, properties and structures. The chemical and structural properties of these novel materials can be exploited for the fabrication of devices for bio-medical and electronics applications. The combination of a variety of complementary surface-sensitive electron spectroscopies maximizes the information available to the analyst for full quantitative surface characterization of standard and patterned polymer surfaces

This presentation will show how the new Thermo Scientific ESCALAB 250Xi, a multi-technique surface analysis system, can be used to investigate the chemistry and structure of various standard and patterned polymer samples. Chemical changes produced by surface treatments were examined by high energy resolution XPS and angle resolved XPS. Complementary REELS measurements were used to examine the level of carbon unsaturation at the uppermost surface of each of the polymer samples. Ultraviolet Photoelectron Spectroscopy (UPS), REELS and XPS valence band analysis were used together to comprehensively evaluate the valence electronic structure of the polymers.

Chemical and elemental changes as a function of X, Y coordinate were evaluated on both the microscopic and macroscopic scale, employing techniques such as high spatial resolution parallel imaging. The continuous position imaging detector on the ESCALAB 250Xi allows fully quantitative images to be acquired, with full XPS region spectra at each imaging pixel. The ability of ESCALAB 250Xi's advanced Principal Components Analysis algorithms to streamline the processing of such imaging data will be demonstrated.

12:40pm **EW-TuL3 A New Cluster Ion Beam for Depth Profiling Challenging Organic Materials**, ***J.S. Hammond***, Physical Electronics

C_{60} and coronene cluster ion sources have been recently introduced for XPS and TOF-SIMS sputter depth profiling of many polymer materials. These sources have also been very successful for the removal of common organic contamination before XPS and TOF-SIMS surface analysis. This experience with C_{60} and coronene cluster ion sources has revealed several polymer systems for which these cluster sources can not produce "non-destructive" chemical depth profiling with XPS and TOF-SIMS. Typically these polymers are either cross-linked, highly susceptible to radiation induced cross-linking, or are polymerized with bonds that are not amenable to sputter depth profiling. A new gas cluster ion beam (GCIB) source that produces massive argon cluster ions will be shown to successfully produce XPS and TOF-SIMS depth profiles on challenging materials such as polyimide thin films. The GCIB source can also be used to remove ion beam and plasma induced damaged layers on polymer materials.

This new ion source will greatly expand the breadth of materials for which XPS can produce chemical state depth profiles on multi-layer thin films. In addition, the use of a dual beam depth profiling approach with GCIB and LMIG sources on TOF-SIMS instruments will expand the applications for 3D characterization of polymer and biomaterial samples. Examples will be presented demonstrating the benefits of the GCIB for both XPS and TOF-SIMS analyses.

1:00pm **EW-TuL4 Recent Developments in X-ray Photoelectron Spectroscopy Data Acquisition and Processing**, ***D.J. Surman****, C. Moffitt,* Kratos Analytical Inc.*, C.J. Blomfield, A.J. Roberts, S.J. Hutton, G. Mishra*, Kratos Analytical Ltd., UK

X-ray Photoelectron Spectroscopy (XPS) is a powerful analytical technique for material characterization. Over the last several years the instrumentation associated with this technique has undergone many significant enhancements and changes that have substantially improved the capability and effectiveness. These improvements have been related to both the hardware and software systems. We have previously described enhancements that relate to both spectroscopy and imaging as well as detector designs. In this presentation we will describe newer developments that have extended the range of materials that can be analyzed as well as substantially improved the interpretation and understanding of the data.

New developments in the use of Polycyclic Aromatic Hydrocarbons (PAH's) for the preparation and analysis of organic surfaces will be presented. These developments have resulted from an enhanced understanding of the processes involved and optimization of the sputtering conditions required to achieve optimal results. Once the spectral data has been obtained, improvements and the development of new software processing techniques have been employed to further enhance the information content and understanding of the sample composition. The application of these techniques to both organic and inorganic materials will be described.

Tuesday Afternoon, October 19, 2010

Exhibitors & Manufacturers Technology Spotlight
Room: Southwest Exhibit Hall - Session EW-TuA

Exhibitors & Manufacturers Technology Spotlight
Moderator: D.J. Surman, Kratos Analytical Inc., R. Langley, Consultant

3:40pm **EW-TuA6 RJ Lee Group's Advanced FESEM, STEM, and XPS Analytical Consulting Services for Exploring the Nano-World**, *K.L. Bunker, J.L. Sturgeon, T.L. Lersch,* ***B.R. Strohmeier****, J.D. Piasecki*, RJ Lee Group, Inc.

RJ Lee Group, Inc. (RJLG, www.rjlg.com) is an organization of experts who provide the highest quality microscopy, analytical, and consulting services to our clients and partners. Leading organizations come to RJLG for more than data and information. They come for an innovative approach and technical solutions developed through our commitment to quality, reliability, and customer satisfaction. RJLG's multi-technique approach to materials characterization offers comprehensive solutions to complex problems. RJLG is presently the exclusive commercial analytical laboratory in the United States to offer analytical services with a number of advanced instruments that provide unique complementary information for the study of nanomaterials. These instruments include: 1) Hitachi S-5500 ultrahigh resolution electron microscope, which is capable of performing field emission scanning electron microscopy (FESEM) and low energy (30 kV) scanning transmission electron microscopy (STEM); 2) Hitachi HD-2300 high energy (200 kV) STEM, which can also generate FESEM images; and 3) Thermo Scientific K-Alpha X-ray photoelectron spectrometer (XPS). The S-5500, HD-2300, and K-Alpha are three of the most powerful materials and surface characterization instruments available to scientists today. The electron optical designs of the Hitachi S-5500 and HD-2300 microscopes place the sample at the optimum imaging and analytical working distance, allowing concurrent acquisition of high-resolution FESEM and/or STEM images, as well as energy dispersive X-ray spectroscopy (EDS). Both microscopes are equipped with the latest silicon drift detector (SDD) technology for EDS, which allows for high resolution elemental analysis and mapping of nanostructures. A variety of signals can be collected simultaneously including secondary electron (SE) and backscattered electron (BSE) FESEM images and bright field (BF) and dark field (DF) STEM images. A semiconductor-based Protochips Aduro^{TM} sample heating system allows for *in situ* microscopic analysis at elevated temperatures up to 1,200 °C. Therefore, the S-5500 and HD-2300 can provide unique information on samples that single standard microscopy techniques, such as SEM and TEM, are not able to accomplish when used alone. XPS is a highly surface-sensitive and quantitative technique for materials characterization. The Thermo Fisher Scientific Model K-Alpha XPS is a compact, fully integrated, state-of-the-art surface analysis instrument. Nanometer scale sampling depth and its ability to provide chemical state information makes XPS an ideal analytical technique for investigating the elemental and chemical surface composition of nanoparticles and other complex advanced materials. This presentation will give a brief overview of the advanced capabilities of each instrument along with examples of combined applications of these instruments for the characterization of nanomaterials.

Wednesday Morning, October 20, 2010

Exhibitors & Manufacturers Technology Spotlight
Room: Southwest Exhibit Hall - Session EW-WeM

Exhibitors & Manufacturers Technology Spotlight
Moderator: D.J. Surman, Kratos Analytical Inc., R. Langley, Consultant

10:00am **EW-WeM7 TwisTorr: A New Molecular Drag Technology**, ***W. Vissers***, Agilent Technologies, Vacuum Products Division

Agilent Technologies presents the new TwisTorr molecular drag technology. Our new and innovative molecular drag stages, composed of a specific array of pumping channels with spiral design, greatly increase the pumping efficiency in a very compact space. This technology represents a next step in the evolution of hybrid turbo high vacuum pumps, providing significant improvements in pumping performance. The Turbo-V TwisTorr series represents a new category of Turbo Molecular Pumps offering unmatched performance in both pumping speed and compression ratio in the most compact space available. The innovative TwisTorr stages allow reaching the highest levels of compression ratio for light gases in commercially available Turbo Molecular Pumps. Using the patented TwisTorr molecular drag technology, Agilent has developed the Turbo-V 750 TwisTorr, the Turbo-V 850 TwisTorr and the Turbo-V 2300 TwisTorr.

10:20am **EW-WeM8 Measure Ion flux to Substrate with Novel OCTIV™ RF Current-Voltage Probe**, ***M.B. Hopkins***, *D. O'Sullivan, D. Gahan, P. Scullin*, Impedans Ltd.

The Octiv Single Frequency VI Probe measures the Voltage, Current, Phase, Impedance, Harmonics, Real Power, Forward Power and Reflected Power delivered to a plasma chamber by an RF source. Octiv is a single frequency, inline RF VI Probe. The probe contains an RF VI sensor and high speed data acquisition system, utilising an ultra high-speed digital Fourier Transform for high accuracy measurement of fundamental RF voltage, current and phase.

The Octiv probe is housed in a single, compact enclosure, and is easily installed on all high power RF equipment encountered in the laboratory or industrial environment. A USB connection provides power and data access to the sensor. An adaptor kit can be supplied with the probe to enable connection with standard RF equipment. The Octiv also operates in Pulsed RF plasmas.

Impedans has recently added a unique feature to the Octiv product to allow the capture of the real and imaginary current to an RF biased electrode. In this presentation we will explain how this unique patent pending feature allows the user to measure the ion flux to an RF biased substrate in a processing plasma. The technique works well even when the Substrate is insulating. The ion flux is a key parameter in process control of many plasma processes.

Wednesday Lunch, October 20, 2010

Exhibitors & Manufacturers Technology Spotlight
Room: Southwest Exhibit Hall - Session EW-WeL

Exhibitors & Manufacturers Technology Spotlight
Moderator: D.J. Surman, Kratos Analytical Inc., R. Langley, Consultant

12:00pm **EW-WeL1 Novel Detectors and Electron Sources for Vacuum and Elevated Pressure Environments**, *P. Holmes, **W. Netolicky**, B.N. Laprade*, PHOTONIS USA, Inc.

This presentation will address several unique applications, including electron multiplier and MCP detector operation in high pressure applications, such as RGA's; "cold" electron source arrays for vacuum environments; and novel microchannel plate shapes and configurations for specialized instruments.

12:20pm **EW-WeL2 Simplicity Solutions™ from the Granville-Phillips® Portfolio will be Introduced as a New Line of Gas Analysis Instrumentation**, ***K. Van Antwerp**, G. Brucker*, Brooks Automation, Inc.

Simplicity Solutions™ from the Granville-Phillips® portfolio will be introduced as a new line of gas analysis instrumentation and two new vacuum quality monitoring products based on Anharmonic Resonant Ion Trap Technologies for use in low mass range mass spectrometry and vacuum quality measurement applications. A brief description of the technology will be provided, a comparison to other low mass range separation technologies will be described and examples of key mass spectrometer performance characteristics will be shown. We will further stress the importance of the vacuum quality index as a method to reduce complex measurements into easy to understand instrumentation outputs.

12:40pm **EW-WeL3 Synchronous Motion, Close Proximity Sputtering System**, ***R. Belan***, Kurt J. Lesker Company

Conventional sputtering systems have a well defined relationship between the size of the substrate being coated, sputtering gun target size, and the throw distance that separates the substrate from the sputtering gun. Substrate size and the required thin film uniformity are the key factors from which the sputtering gun size and the throw distance are then derived. We report on a sputtering system developed at the Kurt Lesker Company that breaks these geometric dependencies while at the same time delivering thin film uniformity of +/-1% or better and sputtering rates that are 5 to 10 times greater than most standard sputtering systems which follow conventional codependent geometries. This rate improvement can be achieved with metal or insulating targets using RF, DC, or pulsed DC power. This sputtering system works by placing the sputtering gun very close to the substrate (<1”) and then synchronizing the travel of the sputtering gun across the face of a rotating substrate, controlling the rotational speed of the substrate, and controlling the power that the sputtering gun is operating at as the sputtering gun deposits its target materials. The advantages of this sputtering system, the economy of scale, and the versatility will be explained.

1:00pm **EW-WeL4 Internet Access to your Thin Film Deposition Systems**, ***C. Malocsay**, T. Haight*, Semicore

For years, field service by factory personnel for a deposition system meant getting in a car, plane or other mode of transportation, sometimes spending as much time in travel as the actual service, and, of course, adding that cost. After many years of arm twisting, cajoling or direct threats from a manager, internet access to many high end deposition systems has come to reality. It has taken 20 years for computer control to become a mainstay in the operational architecture of thin film deposition systems. Now with that hurdle gone, resistance to on-line service and support is the next obstacle to overcome.

1:20pm **EW-WeL5 BIG SIMS, LITTLE SIMS**, ***N. Long***, SAI, UK

ToF-SIMS has become the tool of choice in a wide variety of today's surface and interface analysis tasks. The level of performance required of these tasks varies enormously, resulting a wide range in the capability of available instruments. SAI's expertise in ToF-MS technology has enabled it to offer instruments both at the top end of the scale and at the entry level making sure customers are uniquely well served in their quest to match investment levels to their task set. Illustrative data will be presented in the talk to demonstrate the concept across the gamut of SIMS applications.

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