Tuesday Lunch, November 1, 2011

Exhibitor Technology Spotlight
Room: West Exhibit Hall - Session EW-TuL

Exhibitor Technology Spotlight
Moderator: Langley

12:20pm **EW-TuL2 New Developments in Surface Analysis from Thermo Fisher Scientific**, *T.S. Nunney,* ***R.G. White****, A. Bushell, P. Mack*, Thermo Fisher Scientific, UK

Surface structure and chemistry are crucial to the successful production and operation of innumerable devices, materials and coatings. X-ray photoelectron spectroscopy, with its high surface specificity and chemical state sensitivity, is an ideal tool for the evaluation of material composition. XPS depth profiling allows the identification of chemical variations in materials from the surface to bulk, and facilitates characterisation of complex layer structures. Recent advances in ion source design have seen the introduction of noble gas cluster ion beams for depth profiling applications, which allow materials that are unstable under monatomic ion bombardment to be analysed.

Solutions to structural and chemical problems using the full range of state-of-the-art, fully integrated X-ray photoelectron spectrometers from Thermo Fisher Scientific are presented. These include the characterisation of thin film polymer coatings, and determination of the structure of multilayer stacks. The effectiveness of the analyses, and the automated data refinement processes using new features of the award-winning Avantage datasystem, are shown for each of these examples.

12:40pm **EW-TuL3 A Complementary Approach to the Chemical and Structural Characterization of Graphene with Raman and X-ray Photoelectron Spectroscopy**, ***T.S. Nunney****, R.G. White,* Thermo Fisher Scientific, UK*, M. Wall,* Thermo Fisher Scientific*, K. Bolotin,* Vanderbilt University*, H.M. Meyer III*, Oak Ridge National Laboratory

The application potential of graphene is currently being extensively explored by the materials science community. Its utility as a transparent conductive electrode for the microelectronics industry is already being exploited. More recent progress has demonstrated how the unique combination of electronic, chemical, and structural properties of graphene will have a significant impact on the development of next-generation thin film transistors. Additional applications of graphene to molecular sensors are underway. In all stages of development there is a critical requirement for materials characterization and analysis: from the initial research stages through to testing of the finished devices. Because most materials need to be analyzed for compositional homogeneity both across the surface and through the thickness of a given sample, a complementary approach involving several techniques is often required.

In this presentation we will discuss how a multi-technique approach using Raman spectroscopy and XPS can address the problems associated with the analysis of ultra thin film materials. Raman microscopy is a vibrational technique that is very sensitive to small changes in a molecule's geometric structure and its environment. This sensitivity allows Raman to be used as a probe for a number of properties important to a specific graphene sample. These properties include, but are not limited to layer thickness, the presence or absence of defects, and local strain. XPS enables complete characterization of thin graphene films with respect to chemical modification, in addition to the chemical interaction between the film and the substrate. The combined XPS/Raman measurement approach will be applied to graphene produced by both exfoliation and CVD methods, providing a full comparison of the chemical and structural information offered by each technique.

1:00pm **EW-TuL4 Optimized XPS Depth Profiling of Organic Materials using Polyatomic Ion Sources**, ***D. Surman***, Kratos Analytical Inc.*, C. Blomfield, A. Roberts, S. Page*, Kratos Analytical Ltd., UK

Over the last several years multiple methods have developed for the depth profile analysis of organic materials using a variety of different polyatomic species as the sputtering ion. It has also become clear that different classes of polymers require quite different sputtering parameters to be effectively profiled with no loss of chemical information. In this presentation we discuss a variety of approaches that have developed in order to effectively sputter profile a wide range of materials. These approaches utilize differences in ion beam energy, impact angle and sample temperature in order to achieve an effective sputter profile.

1:20pm **EW-TuL5 Advances in XPS Chemical Imaging and Depth Profiling**, ***J.S. Hammond****, D.G. Watson, P.E. Larson, S.N. Raman*, Physical Electronics

Optimized scanning x-ray microprobe technology has been shown to provide superior sensitivity with minimal data artifacts for micro-area XPS. To improve the chemical state sensitivity, computation methods have been developed to provide a 10X improvement in count rate for chemical state spectroscopy with reduced x-ray damage. Utilizing the unscanned analyzer mode of operation, a user selectable number of data channels are now available for optimized chemical state imaging and chemical state depth profiling. Examples of these new computational methods will be presented for XPS chemical state imaging of patterned semiconductor and polymer samples as well as organic XPS depth profiling.

Exhibitor Technology Spotlight
Room: West Exhibit Hall - Session EW-TuA

Exhibitor Technology Spotlight
Moderator: Langley

3:20pm **EW-TuA5 Selecting the Best Metrology Method for Monitoring Thin Film Deposition**, ***T. Ballinger***, Bruker

This presentation will include a discussion of traditional metrology techniques, in addition to recent innovations in metrology technology for monitoring thin film deposition. Measurement techniques to be discussed include contact methods such as stylus profilometry and non-contact methods such as white light interferometry and confocal microscopy, as well as scanning probe microscopy. A comparison of the various technologies will be provided, as well as the advantages and disadvantages of each metrology method for thin film measurements. This presentation is designed to provide attendees with the information necessary to determine the best metrology technique to monitor thin films below one micron (down to 1 nanometer) and thick films over 10 microns. The hardness, softness or optical properties of the films and substrates will be addressed, on how they can influence the decision in selecting a metrology method for a particular application. Also included in the presentation will be a description of thin film stress and how tensile or compressive stress in the film can adversely affect the film adhesion and cause other defects and product failures if not properly and accurately measured and controlled.

Exhibitor Technology Spotlight
Room: West Exhibit Hall - Session EW-WeM

Exhibitor Technology Spotlight
Moderator: D. Surman, Kratos Analytical Inc.

10:20am **EW-WeM8 Using the Apple IPAD with your PVD System Maintenance**, ***C. Malocsay***, Semicore

Rarely does one item change several industries at once like the Apple IPAD or other tablet computers. Semicore has followed other major companies that have taken this device and applied it to increase productivity and reduce costs. Not a replacement for your PC but considered as an extension of your computer just like a wireless mouse. Applications available at little or no cost can increase the users effectiveness in Thin film vacuum deposition systems and their day to day operation.

Exhibitor Technology Spotlight
Room: West Exhibit Hall - Session EW-WeL

Exhibitor Technology Spotlight
Moderator: Langley

12:20pm **EW-WeL2 Granville Phillips Autoresonant Ion Trap Mass Spectrometer**, ***S. Lass***, Brooks Automation, Inc.

Granville-Phillips®, the Instrumentation Center for Brooks Automation Inc., recently introduced the VQM830 Vacuum Quality Measurement (VQM) System for gas analysis at high and ultra-high vacuum levels that is comprised of a high-speed Autoresonant Ion Trap Mass Spectrometry (ART MS) Sensor and High Performance VQM Controller. With advantages in speed, power consumption, simple calibration, accurate low mass reporting, and UHV performance, the VQM surpasses the traditional RGA products. In addition to explaining the advantages if this next generation mass spectrometer, new additions to the VQM family since initial product shipment will be covered.

12:40pm **EW-WeL3 Combining NEG and Sputter Ion Pump Technologies to Meet the Challenges of UHV-XHV Systems**, ***B. Garcia***, *F. Siviero, A. Conte, L. Viale, A. Bonucci, P. Manini, L. Caruso, A. Cadoppi*, SAES Getters

Current UHV and XHV vacuum technology requires better vacuum, lower power consumption and smaller components. The NEXTorr pumping system meets these requirements by providing large pumping, good gas capacity. low power consumption and vibration free pumping in an unprecedented small size. Specifications and data will be presented to discus advantages of the NEXTorr pumping system.

1:00pm **EW-WeL4 EW - No Title - EW - No Title**, ***S. Palmer***, Agilent - Varian Vacuum Division

1:20pm **EW-WeL5 Faster, Higher Resolution and More Accurate Imaging with the Cypher™ Atomic Force Microscope**, ***K. Jones***, Asylum Research

Within four years of the invention of the AFM, micro-fabricated cantilevers with integrated tips appeared, saving early practitioners from the joys of hand-assembling their cantilevers. However, even though many researchers soon understood the benefits of further miniaturization of the lever, standard commercial levers remained at the same 100 to 300 µm size for nearly the next two decades, in part because making a commercial instrument capable of using much smaller levers presented significant technical challenges.

Within the past few years, commercial instruments like the Cypher AFM, from Asylum Research, have appeared which are capable of using cantilevers as small as 10 µm in length and with resonance frequencies 5 MHz and higher and those levers are now readily available. Small levers bring two major benefits to AFM. The first is much smaller thermal noise, enabling quieter force measurements and higher resolution imaging with Angstrom-scale cantilever amplitudes. The second is a major speed boost for AC modes (tapping, non-contact) in both air and liquid. When coupled with other instrumental improvements such as a high-speed scanner, the shorter levers allow scanning with good tracking at rates 20X to 40X what was possible with conventional levers. I will talk about the technical details behind both these improvements. I will also present images and movies highlighting the improvements, including images showing individual vacancy defects on crystals and movies showing fast scanning on polymers, crystals, and biological samples.

1:40pm **EW-WeL6 SpringerMaterials – An Online Resource Facilitating Vacuum Research and Development**, ***M. Shaikh***, SpringerMaterials

SpringerMaterials is an invaluable database for research both exploring and requiring vacuum science, as well as for the development of equipment that harnesses vacuum technology. Use this online resource to search for data on materials' interactions with photons and electrons, molecular constants, coupling constants via nuclear magnetic resonance data, band structures via Photoelectron Spectroscopy, electronic transport, thermal and optical properties for a huge range of semiconductors, surface sciences and properties, characterization methods, metallic and organic thin films, particle detector systems, and so much more! With over 100,000 critically evaluated documents on properties of about 250,000 different substances, a robust metacontent system and advanced search engine, you are sure to find what you are looking for vacuum research and development.

Find out more at the Spotlight Session on SpringerMaterials at AVS 58

Authors Index

Bold page numbers indicate the presenter

— B —

Ballinger, T.: EW-TuA5, **2**
Blomfield, C.: EW-TuL4, 1
Bolotin, K.: EW-TuL3, 1
Bonucci, A.: EW-WeL3, 4
Bushell, A.: EW-TuL2, 1

— C —

Cadoppi, A.: EW-WeL3, 4
Caruso, L.: EW-WeL3, 4
Conte, A.: EW-WeL3, 4

— G —

Garcia, B.: EW-WeL3, **4**

— H —

Hammond, J.S.: EW-TuL5, **1**

— J —

Jones, K.: EW-WeL5, **4**

— L —

Larson, P.E.: EW-TuL5, 1
Lass, S.: EW-WeL2, **4**

— M —

Mack, P.: EW-TuL2, 1
Malocsay, C.: EW-WeM8, **3**
Manini, P.: EW-WeL3, 4
Meyer III, H.M.: EW-TuL3, 1

— N —

Nunney, T.S.: EW-TuL2, 1; EW-TuL3, **1**

— P —

Page, S.: EW-TuL4, 1
Palmer, S.: EW-WeL4, **4**

— R —

Raman, S.N.: EW-TuL5, 1
Roberts, A.: EW-TuL4, 1

— S —

Shaikh, M.: EW-WeL6, **4**
Siviero, F.: EW-WeL3, 4
Surman, D.: EW-TuL4, **1**

— V —

Viale, L.: EW-WeL3, 4

— W —

Wall, M.: EW-TuL3, 1
Watson, D.G.: EW-TuL5, 1
White, R.G.: EW-TuL2, **1**; EW-TuL3, 1