

Tuesday Morning, October 16, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-TuB

Exhibitor Workshops

Moderator: R. Childs, Consultant

10:00am **EW-TuB1 New AFM Imaging Technique-Dual ACTM Mode.**
R. Proksch, D. Bocek, C. Callahan, J. Cleveland, T. Day, J. Li, A. Moshar,
Asylum Research

In a new AFM imaging technique, Dual AC Mode, the cantilever is driven at or near two of its resonant vibrational modes. For commercially-available cantilevers, these resonant modes are not harmonic. The amplitude and phase signals measured at the different frequencies show very different contrast on a variety of samples.¹ The workshop will discuss how Dual AC mode works and show application examples of Dual AC on magnetic samples, material and bio samples. In addition to images of a variety of samples, we will also discuss amplitude and phase vs. the tip sample distance curves which further elucidates the physics of the contrast formation.

¹R. Proksch. Multifrequency, repulsive-mode amplitude-modulated atomic force microscopy. Applied Physics Letters 89, p. 113121, (2006).

10:20am **EW-TuB2 What a Certified Rebuilt Pump Really Is - And Why It's Important.** *G. Govola*, FMG Enterprises

What is FMG Certified Program? For those who want their remanufactured pumps to work right the first time, and keep their line technicians focused on maximum tool productivity, FMG Certified ProgramTM is a validation process of the technical competencies and expertise needed to plan, deploy, support, and service FMG's Pumps. The FMG Certified ProgramTM is a structured certification with emphasis on precision, reliability, durability and performance. Each Rebuild Pump that leaves FMG has been thoroughly inspected by our factory certified technicians and backed by our Certification process. FMG has geared up to be equal if not better than the factory specifications for high quality Rebuild Vacuum Pumps. FMG CertifiedTM assures that you will get products as good or better than new because FMG goes the "extra mile" at every step. Procedure of Rebuild: FMG has developed our own internal disassembly, cleaning, reliability, testing, detailing and shipping; Technicians: All of FMG's technician's are factory trained and Certified on each pump type; Documentation: Disassembly, evaluation, build sheet, data sheet, final assembly sheet. Test and Quality Assurance sheet, Paint QA and shipping documentation are recorded; Pump Tracking: Internal database monitors incoming rebuilds in every stage of the rebuild process. Features: Electrical 100 point inspection, Electrical/Module/Software, Mechanical parameters, Perform vacuum integrity leak check beyond OEM specifications, 36 performance burn-in reliability checks, Final Quality Assurance Inspection check, Check and record pump parameters including fluid levels, temperatures, pump flows, Perform visual and vacuum integrity leak check, and Check any facility issues directly associated with the pump; system leak check. Advantages: Foresee potential problem areas before any occurrences may arise-through extensive evaluations; Extends pump life, positively affects bottom line with reduced numbers of pump rebuilds or purchases; Maximize overall equipment uptime for production; Cost Savings; and Statement of work performed.

Tuesday Lunch, October 16, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-TuL

Exhibitor Workshops

Moderator: R. Childs, Consultant

12:20pm **EW-TuL1 Thermo Scientific Surface Analysis**, *R.G. White*, Thermo Fisher Scientific, UK

There is a wide range of requirements within the surface analysis community, including the need for multi-technique and preparation options. High quality data and reliability are common requirements for both academic and industrial users. ESCALAB 250 is principally a high-sensitivity, high energy resolution imaging XPS instrument. The flexible configuration of this system allows additional analytical options, chamber configurations and sample preparation facilities. Analytical options include additional X-ray anodes, UV lamp and a 95nm electron source. Theta Probe is an integrated XPS system designed with the unique ability to collect small and large area angle resolved XPS without the need to tilt the sample. This, in combination with the suite of accompanying software, makes this instrument a very powerful tool in the analysis of nano-scale layers. This method of rapid data collection allows the analyst to combine mapping with ARXPS to provide uniformity, thickness and composition maps of ultra-thin films. The latest offering from Thermo is K-Alpha. This is designed to provide XPS analysis with the highest possible throughput. It achieves this by combining high-sensitivity, monochromated XPS with a degree of automation that removes the need for the analyst to be involved with routine repetitive tasks. This is the ideal instrument for a multi-user environment. Each of the above instruments is controlled by the market leading data system, Avantage. This is a comprehensive, integrated data system based on Windows XP. In addition to instrument control and data processing, it provides the capability of remote control via a network and a simple interface to Office applications for automatic reporting.

12:40pm **EW-TuL2 New Developments in Surface Analysis Instrumentation from Physical Electronics**, *S. Bryan*, Physical Electronics

This presentation will provide an update on the latest product developments from Physical Electronics. At the AVS National Symposium in 2006 PHI introduced two new products to the market, the PHI 5000 VersaProbe and the PHI TRIFT V nanoTOF. Over the past year, additional options have been added to these two new products. In addition, the top-of-the-line Quantero XPS Microprobe and the 700 Scanning Auger Nanoprobe will be discussed.

1:00pm **EW-TuL3 Commercially Available High-Throughput Dip Pen Nanolithography®**, *T. Levesque*, NanoInk, Inc.

Dip Pen Nanolithography® (DPN®) is an inherently additive SPM-based technique which operates under ambient conditions, making it suitable to deposit wide range of biological, organic, and inorganic materials. Further, massively parallel two-dimensional nanopatterning with DPN is now commercially available via NanoInk's 2D nano PrintArray™, making DPN a high-throughput, flexible and versatile method for precision nanoscale pattern formation. By fabricating 55,000 cantilevers (each with its own nanoscale tip) across a 1 cm² chip, we leverage the inherent versatility of DPN and demonstrate large area surface coverage, routinely achieving throughputs of 3x10⁷ μm² per hour.

1:20pm **EW-TuL4 Modern Aluminum Vacuum Chambers**, *J. Bothell, K. Coates, E. Jones*, Atlas Technologies

Modern Aluminum Vacuum Chambers: Low cost and superior vacuum performance to stainless steel. Historical evolution of aluminum: With the invention of the ConFlat knife-edge sealing system by Varian stainless steel became the recommended material to achieve high and ultra high vacuum. Aluminum was dismissed because of a lack of a robust sealing system, a misunderstanding of oxide surfaces and a lack of understanding of welding techniques. This paper will present: 1. Aluminum surface preparation methods techniques and instruction on cleaning and detailing materials. 2. Welding methods and techniques, materials, equipment and processes to weld aluminum surfaces 3. Aluminum sealing techniques such as the Atlas Flange. 4. Why aluminum vacuum chambers are lower cost than stainless steel. Finally the paper will present data as to the vacuum properties of aluminum vacuum chambers.

1:40pm **EW-TuL5 Pfeiffer Vacuum Introduces Complete Vacuum System for Mobile Analytical Equipment**, *J. Keller*, Pfeiffer Vacuum, Germany

Pfeiffer Vacuum, one of the world's leading producers of vacuum products and services, introduces a durable, reliable and compact vacuum system for mobile mass spectrometry. Able to run at lower power levels, Pfeiffer Vacuum's compact vacuum system integrates a turbopump and a specially designed dry diaphragm pump that allows analytical equipment to provide real time analysis in the field. This mobile vacuum systems runs on 24 volts with a power save mode when idling. The vacuum system is available with TMH 071 or TPD 011 l/s turbopumps and the MVP 006, a new diaphragm backing pump. This system can be configured to fit analytical OEM requirements. Pfeiffer Vacuum's TMH 071 turbopump is a 70 l/s, hybrid magnetic design with excellent specifications and highest reliability for mass spectrometry. This pump is currently integrated into dozens of mass spectrometers with thousands sold each year. The TPD 011 turbopump is designed with a unique dual end supported bearing making it the most rugged and smallest commercially available turbopump in the world. The TPD 011 makes possible the design of several portable mass spectrometers that could not have been built with any other pump. The MVP 006 dry diaphragm backing pump is ideal for small mass spectrometry systems because smart electronics communicate with the turbo directly automatically speeding the pump up and down based on demand. This feature optimizes power consumption, vibration, and diaphragm life. In addition, only one power supply is needed for both pumps, and the 24 VDC input simplifies electronic requirements.

Tuesday Afternoon, October 16, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-TuA

Exhibitor Workshops

Moderator: R. Childs, Consultant

3:20pm **EW-TuA6 High Speed, High Resolution XPS Imaging**, *C. Blomfield, S. Page, S. Hutton, D. Surman*, Kratos Analytical

XPS imaging is an established method for determining the qualitative lateral distribution of chemical species across a sample surface. Early methodologies for this technique involved XPS maps where a virtual or X-ray probe was scanned across a sample surface and an image built up pixel by pixel as the analysis point was moved across the sample. Other methods involved the parallel detection of a predefined field of view over one specific binding energy range. Improvements in detector technology and instrument design have led to the development of truly quantitative pulse counting methods which give high lateral resolution XPS images with quantitative intensities over short time intervals. This presentation describes the technology required to achieve this level of performance and illustrates some applications which benefit from a quantitative chemical state imaging technique.

3:40pm **EW-TuA7 Chemical Sample Characterisation on the Nanoscale: Imaging XPS with Ultimate Spatial Resolution**, *M. Green, M. Maier*, Omicron NanoTechnology, Germany

In this contribution we briefly summarize the current status of novel instrument design in imaging XPS (iXPS) achieving ultimate resolution beyond today's traditional limits. In iXPS a great obstacle for higher resolution is the limited X-ray brilliance in the analysis area in combination with the small electron acceptance angle of current spectrometers. Today commercial laboratory instruments are limited to approx. 3 μm resolution. Acquisition times as well as time for experiment set up increase unacceptably when the attempt is made to utilize this kind of resolution routinely. In particular with those instruments acquiring each image pixel sequentially by either scanning the X-ray beam or the analysis spot. We present first results acquired with a NanoESCA instrument installed at LETI. A new lens concept provides a huge progress for the acceptance angle of photoelectrons. This is combined with a patented aberration compensated analyzer allowing the acquisition of typically 640x512 image pixels in a single shot. This offers the unique possibility to achieve sub micron image resolution routinely as well as small spot spectra from well-defined areas below 1 μm diameter, within reasonable acquisition times.

Wednesday Morning, October 17, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-WeB

Exhibitor Workshops

Moderator: R. Childs, Consultant

10:00am **EW-WeB1 Thiol Applications: Model Surfaces, Cutting Edge Technologies and Educational Platforms**, *D.J. Graham*, Asemblon, Inc.

In this workshop we will highlight the use of alkanethiols in biomaterials, nanotechnology and molecular electronics. For decades, thiols have been used to control surface chemistry and study surface interactions in a wide range of fields. Thiols have again come into the forefront of research with the new developments in nanoparticles and increased interest in self-assembling systems. Come learn about how thiols are being used today and see a new educational kit developed by Asemblon for teaching about nanotechnology and surface modification

10:20am **EW-WeB2 Electronic and Magnetic Transport Measurements with Probe Stations**, *J.R. Lindemuth*, Lake Shore Cryotronics

Electronic and magnetic transport based on tunneling is an extremely important technology area of nanotechnology and mesoscopic devices. Tunneling of unpolarized electrons is the phenomena responsible for tunnel diodes and negative differential resistivity (NDR). NDR devices are one of the leading candidates for high speed, low power consumption switching devices required by ITRS. Tunneling of spin polarized electrons in magnetic tunnel junctions create large room temperature tunneling magnetoresistance that will be used in the next generation of magnetic read heads. Measurement of tunneling transport requires a stable controlled environment for both the temperature of the device and the magnetic field of the device. For convenience of measurement, a manipulated probes station with fast sample turn around is required. Using probes, instead of attached wires, is a very convenient method for doing electrical measurements. However, the probes can influence the electrical, temperature and magnetic environment of the sample. I will discuss the impact of using probes and describe some of the systematic and random errors this technique can introduce into the measurement as well as methods to mitigate these effects. There are many different mechanisms and applications for tunneling. Each mechanism requires understanding and a careful design of the measurement system. Although there are many design criteria common to all tunneling experiments, each mechanism has its own special requirements. This presentation will show results of a variety of tunneling transport measurement, including NDR and TMR, with emphasis on methods and instrumentation for optimal results.

Wednesday Lunch, October 17, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-WeL

Exhibitor Workshops

Moderator: R. Childs, Consultant

12:40pm **EW-WeL2 How to Avoid a Failure During Shutdown or Start-up Events**, *M. Silva*, FMG Enterprises

Participants will learn how to maximize their uptime success rate, and minimize downtime at shut down and start up events (cold and hot). Both facility and production line levels. We will review the preparatory steps and tasks needed to ensure avoidance of failure during these events. Importantly, participants will share their experiences and lessons. Other tasks such as PM Programs, Base line characterization of pumps, and Inventory Control will also be reviewed. Course outline Shutdown cold: define Example of event: facility shutdown. Shared experience Shutdown hot: define Example of event: facility running, production shutdown. Shared experience Start-up event: Start-up cold: define Example of event: coming up from cold shutdown. Shared experience Star-up hot: define Example of event: turning on of a production line. Shared experience Review preparatory steps of how to ensure avoidance of failure during shutdown or start-up events. Discuss other tasks that can be done during shutdown or start-up events: 1) PM programs. 2) Base line charactering of pumps. 3) Inventory control. All are programs that FMG provides, along with practical training methods for their in-house technicians.

1:00pm **EW-WeL3 Sputter Target Bonding Technology**, *J.R. Gaines*, Kurt J. Lesker Company

LeskerBond™ Services offers the patented NanoBond® process technology and patented NanoFoil® under license from RNT. NanoFoil® is a free-standing foil capable of generating heat. NanoFoil® is comprised of hundreds, or even thousands, of fine, nanoscale size layers of aluminum and nickel which, when placed between two prepared materials and energized, creates an extremely effective bond. In this presentation we will describe how NanoFoil® is made and we'll explore the various applications of NanoFoil®. Specifically, we will examine the application of NanoFoil® for bonding sputtering targets. We will also present case studies that compare and contrast bonding with NanoFoil® versus traditional bonding methods.

1:20pm **EW-WeL4 Ion Energy and Ion Flux Measurements at an RF Biased Surface**, *M. Hopkins*, Impedans Ltd.

Impedans is introducing the first floating Retarding Field Energy Analyzer which will allow measurement of the Ion Energy Distribution Function on an RF biased substrate. RFEAs are used in research laboratories to measure ion energy distribution functions. Their use in practise is limited by the need to ground the analyser, whereas most interesting applications are in RF biased substrates. The IEDF is important in understanding the role of ions in processes such as etch. Deviations in ion energy can lead to charging effects on a substrate or wafer and variations in flux can effect etch uniformity. A transition from a high frequency (single peak distribution) to a low frequency (bimodal distribution) sheath is often observed in RF plasma sources. The energy difference between the two peaks of the bimodal distribution is related to the RF modulation of the plasma potential and to the ratio between the ion transit time in the sheath and the RF period. A change in ion mass can result in changes in bi-modal structure and impact the average energy of ions arriving at the substrate or wafer. Due to the complexity of modelling the ion energy profiles, measurements are often necessary to validate the behaviour of a new source design in etch applications. The Impedans RFEA is unique in that it uses the technology developed to float RF Langmuir probes in order to isolate the RFEA from electrical ground. The analyser is built into a dummy wafer and placed on the chuck or wafer holder. The RFEA sensor does not disturb the RF bias and the measured Ion Flux and Ion Energy are similar to that seen by a wafer. By placing multiple sensors on a dummy wafer a spatial scan of the ion energy distribution and flux can be achieved. This is invaluable data to understand the plasma process and its effects on the surface of interest. The Impedans RFEA is designed to operate in hostile environments and can withstand temperatures of several hundred degrees centigrade.

1:40pm **EW-WeL5 Recent Developments: STM 150 Aarhus and FE-LEEM P90**, *O. Schaff*, Specs, Germany

SPECS has developed a new temperature design for the original STM 150 Aarhus system. Excellent performance in terms of mechanical stability and thermal control could be demonstrated for LN2 temperatures and temperatures exceeding 1000°C up to 1200°C. The high temperature performance of the new design is demonstrated using first results of a Si(111) sample in a FE-LEEM P90 sample holder. Atomically resolved phase transitions of the (7x7) <-> (1x1) surface reconstruction could be observed easily. The FE-LEEM P90 is a next generation Low Energy Electron Microscope with unsurpassed resolution for dynamic LEEM microscopy experiments. With this instrument, based on the design of Dr. Rudolf Tromp, nanometer scale demonstrates on surfaces can be observed in real-time. The instrument can be upgraded with an electron mirror for aberration correction, The design resolution for the corrected FE-LEEM P90 is below 2nm.

Wednesday Afternoon, October 17, 2007

Exhibitor Workshops

Room: Exhibit Hall - Session EW-WeA

Exhibitor Workshops

Moderator: R. Childs, Consultant

3:20pm **EW-WeA6 New Small Dry Vacuum Pump for Scientific and Industrial Applications**, *S. Palmer, K. Caldwell*, Varian, Inc.

The IDP-3 is a compact, high performance dry pump that provides affordable oil-free vacuum and easy system integration, and is suitable for a wide variety of applications. The IDP-3 employs an innovative hermetic design in which the motor and bearings are outside the vacuum space, allowing full isolation of all pumped gases. Delivering a robust pumping speed of 60 l/m and a very low base pressure of less than 250 milliTorr, the IDP-3 provides all the advantages of Varian's patented scroll pump technology in a compact, lightweight, cost-effective package.

3:40pm **EW-WeA7 Preventing The 10 Most Costly Mistakes in Vacuum Pump Operation**, *C. Long*, FMG Enterprises

Most pump failures are not caused by the pump. They are usually caused by the tool, facilities, or poor maintenance. This short-course is a must for anyone who wants to avoid such costly mistakes. It will be taught from the perspective of a pump owner that wants to reduce overall pump operating expense. Participants will leave with a check-list, and valuable insights relative to each point. As the result of following course recommendations, participants will be able to raise the uptime available on that pump, and also be able to plan ahead of time when the pump will need to be replaced. This will greatly lower the cost of lost product for the pump owner. We will also briefly discuss: - How to choose the correct pump for the application, - What to do during the installation of the pump, - What to look for, and do while the pump is running, - When, and what PM's will need to be done to the pumps, - How to determine when a pump should be pulled for maintenance, repair or replacement, And finally why the pump owner should use FMG to maintain their pumps. What FMG can do for you and how FMG can save your company money. How FMG can partner up with your company and allow your company to concentrate on what it does best. Sample Content: 1. Improper lubrication 2. Incorrect exhaust settings 3. Unsuitable temperatures 4. Failure to properly leak-check the system 5. Oil levels and color 6. Untimely or incomplete maintenance 7. Cooling water flow-rates 8. Misaligned O-rings 9. Wrong pump or blower for the application. 10. Not using Certified pumps and technicians

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