

Tuesday Afternoon, October 31, 2017

Exhibitor Technology Spotlight Workshops

Room West Hall - Session EW-TuL

Exhibitor Technology Spotlight

Moderator: Chris Moffitt, Kratos Analytical Limited, UK

12:40pm EW-TuL-2 Design and Application of a New Laboratory-Based Scanning XPS/HAXPES Instrument, *R Inoue, H Yamazui, K Watanabe*, ULVAC-PHI, Japan; *S Bryan, John Newman, J Mann*, Physical Electronics

X-ray Photoelectron Spectroscopy (XPS) is a widely used surface analysis technique with many well established industrial and research applications. The surface sensitivity (top 5-10 nm) of XPS and its ability to provide short-range chemical bonding information make the technique extremely popular in materials characterization and failure analysis laboratories. While its surface sensitivity is an important attribute, in some cases, the depth of analysis of XPS is not sufficient to analyze buried interfaces without first sputter etching the sample surface. However, sputter etching can often lead to alterations of the true surface chemistry. For this reason, some scientists turn to another technique - Hard X-ray Photoelectron Spectroscopy (HAXPES), available in some synchrotron radiation facilities. HAXPES utilizes X-rays typically defined as having energies greater than 5 keV. Depending on the energy used, these hard x-rays can provide for depths of analysis 3 or more times those of soft x-rays used on conventional XPS systems. This presentation will describe a newly developed laboratory-based instrument, the PHI Quantes, equipped with monochromated scanning Al K α (1486.6 eV) and Cr K α (5414.9 eV) x-ray sources, thus enabling both traditional XPS and HAXPES experiments in the same instrument. Combining both soft and hard x-ray analyses, we can gain an even better understanding of composition with depth and information at buried interfaces.

1:00pm EW-TuL-3 Application of X-ray Photoelectron Spectroscopy for the Characterisation of Biomaterials, *C Moffitt*, Kratos Analytical Ltd; *D Surman*, Kratos Analytical Limited; *S Coultas, Jonathan Counsell*, Kratos Analytical Limited, UK

The Kratos AXIS series of photoelectron spectrometers are now widely applied to the characterisation of surfaces of biological interest. With its high energy resolution and excellent sensitivity at selected areas, XPS is routinely used to determine the surface chemistry of materials which interact with the native-tissue, organ or function in a body. Both the AXIS Supra and AXIS Nova utilize large sample holders and, when combined with the standard automated sample transfer capability, provides the ability for high sample throughput. These strengths are demonstrated in the XPS characterisation of printed micro-patterned co-polymer arrays leading to the discovery of novel biopolymers. The high spatial resolution imaging capability of the AXIS spectrometers is also used to probe the lateral distribution of surface chemistry of these co-polymer array samples. The recent development of the gas cluster ion source (GCIS) for depth profiling 'soft' materials means that XPS is no longer limited to simple surface analysis. The characterisation of the sub-surface and bulk biomaterial properties is now a reality and is demonstrated in the depth profiling of drug eluting bioresorbable stents. The efficacy of these stents is dependent on the drug distribution through the coating which is measured during a GCIS depth profile. In this presentation we will demonstrate the capabilities of the latest Kratos X-ray photoelectron spectrometers lateral resolution, depth distribution of elemental and chemical states, and detection sensitivity through the characterisation of biomaterials.

1:20pm EW-TuL-4 Advanced Photoelectron Spectroscopies Setup As a Key for Current Research, *Lukasz Walczak*, PREVAC, Poland

PREVAC is intended to provide advance equipment for professionals around the world to state-of-the-art research and development in the field of nanoscience and nanotechnology. We would like to promote the latest products, equipment, technology solutions and innovations for the photoelectron spectroscopies field. Few selected PES systems will be presented for study of important topics, including new materials, topological insulators, surface alloys, superconductors and others phenomena. Details technical descriptions from the systems and subsystems will presented for the laboratory and synchrotron research. Also, it will be displayed some new development of the cry manipulators and various types of the photoelectron spectroscopy components.

1:40pm EW-TuL-5 Advanced Ion Beam Techniques for Thin Films and Structuring, *Marcel Demmler*, AARD

Latest techniques using Ion Beam Technology for localized trimming of thin films to Angstrom level, CMP error correction, precision angled sidewalls, and highly adjustable selectivity of etch.

2:00pm EW-TuL-6 From Surface Spectrometry to 3D Analysis - Latest Trends and Instrumentation for TOF-SIMS, *Nathan Havercroft*, ION-TOF USA; *R Moellers, A Pirkl*, ION-TOF GmbH, Germany

During the last 25 years IONTOF has continuously made significant development efforts to further improve the instrumentation for Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) and related techniques. Some of the most recent achievements include in-situ sample preparation and tomography by FIB, enhancement of maximum count rates and dynamic range in conventional depth profiling of inorganic materials, the design of a TOF-SIMS / SPM combination instrument, as well as the integration of an Orbitrap™ mass spectrometer with unrivalled mass resolution and mass accuracy into the TOF.SIMS 5 instrument. IONTOF's, new TOF.SIMS NCS instrument platform combines all the well-known options of our high-end TOF.SIMS 5 system with the possibility to perform in-situ SPM measurements. The sophisticated, large area SPM unit has a scan range of up to 80 x 80 μm^2 and is ideally suited to provide topographic information for SIMS measurements. Beside AFM, MFM, KPFM and multi-frequency modes it also supports a unique surface profiler mode which allows for fast measurements of large SIMS craters. The new piezo sample stage with submicron position accuracy ensures fast and precise movement between the TOF-SIMS and the SPM measurement position. Depth profiling of organic materials, e.g. layer systems for optical and electronic devices, can be ideally performed using gas cluster ion beams (GCIB) in combination with TOF-SIMS. For optimum performance, a dual-beam approach is usually utilized, employing a lower energetic quasi DC sputter beam for material removal and a short-pulse small-spot analysis beam for optimal mass spectral and imaging performance. However, molecular identification of unknown substances, e.g. contaminants, is usually hampered by constraints in mass resolution and mass accuracy of the TOF analyzer. Furthermore, ions generated in the sputter phase of the dual-beam experiment are lost for analysis. In order to overcome these limitations, a TOF / Orbitrap™ SIMS hybrid instrument has been developed in order to combine all advantages of a state-of-the-art TOF-SIMS with the mass spectrometry performance of a Q Exactive™ HF mass analyzer. The Q Exactive™ HF provides a mass resolution of more than 240,000 @ $m = 200$ u, <1 ppm mass accuracy, and full MS/MS capabilities for structural analysis of complex molecules. By utilizing these unique features, the SIMS analyst can make peak identifications with much greater confidence.

Author Index

Bold page numbers indicate presenter

— B —

Bryan, S: EW-TuL-2, **1**

— C —

Coultas, S: EW-TuL-3, **1**

Counsell, J: EW-TuL-3, **1**

— D —

Demmler, M: EW-TuL-5, **1**

— H —

Havercroft, N: EW-TuL-6, **1**

— I —

Inoue, R: EW-TuL-2, **1**

— M —

Mann, J: EW-TuL-2, **1**

Moellers, R: EW-TuL-6, **1**

Moffitt, C: EW-TuL-3, **1**

— N —

Newman, J: EW-TuL-2, **1**

— P —

PirkI, A: EW-TuL-6, **1**

— S —

Surman, D: EW-TuL-3, **1**

— W —

Walczak, L: EW-TuL-4, **1**

Watanabe, K: EW-TuL-2, **1**

— Y —

Yamazui, H: EW-TuL-2, **1**