Tuesday Afternoon, November 5, 2024

Exhibitor Technology Spotlight Sessions
Room West Hall - Session EW-TuL

Exhibitor Technology Spotlight Session
Moderator: Christopher Moffitt, Kratos Analytical Inc

12:30pm **EW-TuL-3 New Developments for Surface Analysis from Thermo Fisher Scientific*, Tim Nunney**, *P. Mack, R. Simpson, H. Tseng,* Thermo Fisher Scientific, UK

In this presentation we will present the latest innovations in instrumentation for Surface analysis and materials analysis from Thermo Fisher Scientific.

12:45pm **EW-TuL-4 Physical Electronics Spotlight Session: Driving Discoveries Through Surface Analysis: New Methods for Thin Film Characterization*, Amy Ferryman,*** Physical Electronics

Physical Electronics (PHI) innovative technology offers the world's only complete portfolio of powerful surface analysis instruments, including X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). This presentation will highlight recent developments in methodologies for thin film characterization utilizing our fully automated *Genesis*. The multi-technique XPS platform offers an array of optional excitation sources, from valence and conduction bands with ultraviolet photoelectron spectroscopy (UPS) and low energy inverse photoemission spectroscopy (LEIPS) to core level excitation with hard X-ray photoelectron spectroscopy (HAXPES). The *Strata*PHI software package can be paired with the latter to calculate the thickness of advanced multilayer thin film structures.

1:00pm **EW-TuL-5 Kratos Spotlight Session: Kratos Axis Supra+ -- Automated XPS analysis, including HAXPES and operando measurements*, Chris Moffitt,*** Kratos Analytical Inc.

The automation of modern instrumentation allows for broader access to more robust analysis over larger sample sets with advanced approaches.Kratos Axis Supra+ incorporates automated sample handling with automated analysis of XPS, UPS, depth profiling and others, including higher energy Ag-Lα generated, quantitative HAXPES, for increased depth analysis.

The Axis Supra+ allows more samples to be analyzed with the full capabilities of the highest-performing XPS instrument, without intervention.Once samples are physically loaded, analyses are submitted through the computer interface, utilizing multiple cameras for location identification, which can be done remotely.This follows on for utilizing the HAXPES mono source, so that analysis by standard Al-Ka monochromatic x-rays can be automatically followed by analysis with the higher energy Ag-La monochromatic source and the results automatically processed and quantified using new Data Dependent Acquisition software features.

The Axis Supra+ is uncompromised in its ability to analyze the wide range of new advanced materials, including operando surface analysis measurement of battery materials while biasing or flowing current and heating.The multi-contact stage in the Axis Supra$^+$ spectrometer accommodates the specialized holders for the operando analysis, supplying 4 electrical contacts to be used for these analyses, while still accepting all the standard sample platens for high throughput analysis. An inert sample transfer version of these multi-contact holders has also been developed, which allows the sample to be loaded and electrical connections made in a glove box and then loaded into the spectrometer without exposure to atmosphere.Cryo-cooling of battery and other materials has been shown to minimize degradation and chemical bonding damage that can be caused by x-ray exposure at room temperature, and Kratos offers new sample holder options that allow cooling of sample to cryogenic temperatures to mitigate chemical changes during XPS measurement.

Soft materials analysis has greatly expanded in the last several years since the introduction of argon gas cluster ion sources (GCIS), with the Kratos dual mode cluster source also able to perform traditional monoatomic argon profiling of hard inorganic materials.The cluster mode is able to profile light ion materials without the artifacts inherent in monoatomic sputter-etching of these materials.

Additional analytical techniques, such as Ag-Lα HAXPES, ISS, UPS, AES, REELS and IPES are all possible on the Supra$^+$, and additional sample preparation chambers can be easily added, such as a station for deposition or the high-pressure, high-temperature gas reaction cell for catalysis experiments and measurement.

1:15pm **EW-TuL-6 Enviroesca II: An Evolution in Surface Chemical Analysis Under Environmental Conditions*, Stefan Böttcher**, *F. Mirabella, P. Dietrich, A. Thissen,* SPECS Surface Nano Analysis GmbH, Germany

EnviroESCA elevated chemical surface analysis into a new era, bringing operando chemical studies and easily accessible near ambient pressure XPS from fundamental research into applied surface science and standard analytical laboratories. For the recent focus of XPS applications on renewable energies, UHV incompatible specimen and advanced electrochemical studies now it is time for the next step. EnviroESCA II significantly enhances surface analysis capabilities under environmental conditions.

As an evolution from the successful first release, EnviroESCA II keeps the unique operational concept for chemical and dynamical analysis, expanding into bulk, electronic structure and atomic structure analysis, with seamless infrastructure integration and higher operational performance. Using the newly released SPECS AEOLOS 150 AD-CMOS electron analyzer and the μFOCUS 450 multiline X-ray monochromator source EnviroESCA II allows for unrivaled automated routine analysis under environmental conditions with adjustable surface to bulk sensitivity.

1:30pm **EW-TuL-7 Impedans Spotlight Session: Advancing Plasma Understanding and Control: Cutting-Edge Solutions from Impedans Ltd.*, Angus McCarter**, *A. Verma, T. Gilmore,* Impedans Ltd., Ireland

Impedans Ltd. is a leading provider of advanced plasma and RF sensors and plasma control applications, dedicated to enhancing the understanding of plasma processes. Our comprehensive range of products caters to diverse needs in fundamental research, equipment design, calibration and testing, process development, and process control.

We serve a wide array of industries, including semiconductor manufacturing, vacuum coating, medical device production, and aerospace, among many others. Our expertise in plasma diagnostics is recognized globally, with our instruments renowned for their high-resolution and high-speed data capture capabilities.

In this presentation, we will provide an overview of our innovative products and their applications. Our product lineup includes:

1. Bulk Plasma Sensors: Langmuir Probes are designed to measure critical plasma parameters such as electron density, electron temperature, electron energy distribution function, plasma potential etc in any kind of DC/RF/Microwave plasma source with time average and time resolved modes.

2. Substrate Level Sensors: These sensors are crucial for understanding interactions at the substrate level in various plasma processes. The advanced range of retarding field energy analysers provide accurate measurements of ion energy distribution functions, ion flux and also reports live etch/deposition rates during plasma processes.

3. RF Sensors: These VI probes are specialized to measure key RF parameters including voltage, current, phase, impedance, power, and harmonics in both continuous and pulsed applications. Advance sensors allow to measure the same parameters for up to 15 harmonics of the fundamental frequency as well as recreate the RF waveform and predict the ion flux of your plasma.

Our state-of-the-art techniques offer real-time process monitoring, ensuring precise control and optimization of plasma processes. By leveraging our advanced sensors and control solutions, users can achieve greater accuracy and efficiency in their plasma-related research and industrial applications, driving innovation and excellence in their respective fields.

1:45pm **EW-TuL-8 Vital Materials Spotlight Session: Film Properties of LTC V2 - A Low Process Temperature TCO*, Rajiv Pethe**, *S. Yoon,* Vital Chemicals

Vital Materials is a global company providing materials across many industries including displays, photovoltaics, semiconductors etc.We provide materials such as metals, ceramics, semiconductors, and transparent conductive oxides.As the photovoltaic industry moves towards higher efficiencies and low cost processes, this requires innovation of novel transparent conductive oxides that can be processed at low temperatures while maintaining low sheet resistance and high transmission.Having good broadband transmission across the 300-1200nm while maintaining low resistance values would be an added value.Traditional ITO requires high processing temperatures to achieve low resistance. However low resistance also results in lower transmission above 800nm.Vital Materials has been working towards development of such transparent conductive oxides one of which is LTC V2.This presentation will cover Vital Materials core products

and film properties to a new novel material LTC V2 that provides low resistance combined with high transmission across the 300-1200nm wavelength range.

2:00pm **EW-TuL-9 Using VSim to Predict Magnetron Performance Through Multiscale Computations*, Daniel Main,*** Tech-X Corporation

Magnetron sputtering is the most common device for Physical Vapor Deposition (PVD) and is widely used for its many advantages over other thermal methods and other PVD devices.Even within the design of magnetron sputtering devices, there is a wide range of design parameters including the applied voltages, background gases, magnet placement, and chamber design.A Computer-Aided Engineering (CAE) approach of designing these devices *in silico*, instead of the traditional empirical approach, offers the ability to optimize devices like never before.However, the physics of the plasmas produced in these devices, including their important sheath region, makes designing these devices challenging.A particular challenge is the time scale of the underlying physics involved.In this talk, we demonstrate the use of VSim to meet this challenge.

VSim is a 1D, 2D, and 3D multi-physics simulation suite that contains plasma modeling capabilities including surface processes, and collision models. Using VSim, you can design your complete magnetron sputtering setup by correctly modeling the plasma discharge region and the sheath near the cathode and thereby correctly computing the ion flux and ion energy distribution onto the cathode. This detailed understanding is necessary to correctly compute the sputtering yield from the cathode. VSim allows you to design your entire magnetron sputtering setup by (1) computing the external magnetic field based on your permanent magnet configuration, (2) predicting the cathode current and voltage, (3) computing the deposition profile onto the substrate and (4) computing the erosion profile on the cathode. We discuss this workflow and show that the high accuracy VSim provides gives a better and more intuitive approach to optimizing magnetron sputtering devices.

Author Index

Bold page numbers indicate presenter