Tuesday Morning Break, November 8, 2022

Exhibitor Technology Spotlight Workshops
Room Hall A - Session EW-TuMB

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

10:20am **EW-TuMB-2 Edwards Vacuum Presentation - The Future of Vacuum I & II: A Review of Safety Considerations in the Design and Operation of Vacuum Systems*, Andrew Chew,*** Edwards

The Vacuum Industry is, characteristically, comprised of an extremely wide spectrum of applications, techniques and equipment requirements. The assurance of safe operating conditions is a common and unifying factor. This presentation will describe some challenges and requirements for the safe operation of vacuum systems with respect to pumps, gauges and exhaust gas abatement.

Exhibitor Technology Spotlight Workshops
Room Hall A - Session EW-TuL

Exhibitor Technology Spotlight Session II

Moderator: Christopher Moffitt, Kratos Analytical Inc

12:40pm **EW-TuL-3 New Developments in Surface Analysis from Thermo Fisher Scientific***, Adam Bushell, T. Nunney, P. Mack, R. Simpson,* Thermo Fisher Scientific, UK

In this presentation we will detail the latest developments in the Surface Analysis portfolio from Thermo Fisher Scientific

1:00pm **EW-TuL-4 PHI Surface Analysis Solutions: No Compromise***, Jennifer Mann,* Physical Electronics

Physical Electronics (PHI) is the only manufacturer offering surface analysis products for all three main analytical techniques – X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). This presentation will discuss recent developments in all three product lines. Our fully automated XPS system offers unprecedented value not found in conventional XPS instruments, by using multiple techniques covering a full range of energy - from conduction band with low energy inverse photoemission spectroscopy (LEIPS) to core-level excitation with hard X-ray photoelectron spectroscopy (HAXPES). A TOF-SIMS instrument from PHI is optimized for the highest sensitivity elemental and molecular analysis. Our scanning AES instrument is optimized for high magnification chemical imaging and has increased versatility with multiple optional technique add-ons and accessories for specialized experiments.

1:20pm **EW-TuL-5 EnviroMetros – A Novel Surface and Multilayer Thin Film Analysis Tool***, Andreas Thissen,* SPECS Surface Nano Analysis GmbH, Germany

Ultrathin films and 2D materials are continuously gaining relevance for modern devices. Thus, there is growing interest in chemical analysis of such multilayer systems and their surfaces. A detailed characterization of stoichiometries, composition and depth distribution of elements is needed. The novel EnviroMetros series provides the perfect routine analysis tools for this field of research and development by combining large sample and wafer handling with a variable information depth photoelectron spectrometer. In combination with optical and other analytical techniques it allow for a depth dependent composition analysis of unsurpassed precision, reliability and repeatability.

1:40pm **EW-TuL-6 AFM - The Instrument of Choice for Twisted Graphene Preparation and Characterization***, Ted Limpoco,* Oxford Instruments Asylum Research Inc.

2D materials are currently a hot topic in the materials research community as they have been shown to exhibit novel mechanical, optical and electrical properties. Graphene, specifically twisted graphene, exhibits Moiré superlattices that are of particular interest. These samples are prepared by imaging the graphene flakes, cutting them, rotating, and transferring them to new substrates in a specific order. Precise control over the manipulation of graphene and in-depth characterization of the resulting sample properties are crucial steps in the preparation of new and performant 2D material-based devices. To achieve this, a high-performance Atomic Force Microscope (AFM) is the instrument of choice. We present here the best imaging modes and setups to facilitate the twisted graphene sample preparation and characterization. Topography, conductivity, friction and piezoelectric data will be shown and discussed in the context of sample preparation and the expected sample properties.

2:00pm **EW-TuL-7 Automated, High-Performance X-Ray Photoelectron Spectroscopy System for Advanced Analysis of Solid-State Energy Materials and Systems***, Chris Blomfield,* Kratos Analytical Inc., UK

Sensitivity to low material concentrations and the ability to resolve different chemical states are fundamental aspects of surface analysis with XPS, which determine the interpretation and the understanding of the revealed chemistry. Modern automation allows more samples to be analyzed with the full capabilities of the highest-performing XPS instrument, the Kratos Axis Supra$^+$, 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.

Current research into energy storage materials has driven the development of sample holders to accommodate electrical contacts for operando measurement while biasing or flowing current, along with sample heating capability for accelerated aging studies. The multi-contact stage in the Axis Supra$^+$ spectrometer accommodates these specialized holders, 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.

Cluster ion sources for sputter depth profiling have greatly expanded soft materials analysis, opening up previously inaccessible interfaces to the power of XPS analysis. Coupling the multi-contact capability with an advanced, dual mode argon gas cluster ion source (GCIS) allows for profiling of all materials in the sample system, including organic compounds not previously possible. 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 added, such as a station for deposition or the high-pressure, high-temperature gas reaction cell for catalysis experiments and measurement.

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