Wednesday Lunch, November 11, 2009

Exhibitor Workshops
Room: Exhibit Hall 1 - Session EW-WeL

Exhibitor Workshop
Moderator: R.A. Langley, Consultant

12:40pm **EW-WeL3 Time and Phase Resolved Plasma Diagnostics for RF and Pulsed Plasma Applications**, ***M. Hopkins***, Impedans Ltd.

The deposition and etching of layers by plasma discharges operating in pulsed mode have many important applications. The variation of the time parameters of the process (frequency and duty cycle) lead to noticeable modifications of the deposited layers and the etch rate. Plasma diagnostic are now available to measure the change in plasma composition and this is turn is often correlated with the quality of the process. In diamond thin films the quality of films produced is strongly correlated with the concentration of H-atoms, CH and C2 radicals and their evolution during the discharge regime and the afterglow. Indeed, these species are well known either as agents for graphite etching (H), or diamond precursors (CHx imaged by CH) or graphite precursors (C2Hx imaged by C2). In silicon etching anomalous side wall etching, called 'notching' in gate poly-Si etching, is suppressed in pulsed-power chlorine inductively coupled plasma. In order to understand the complex mechanisms involved in pulsed or indeed RF plasma a comprehensive suite of time and phase resolved measurements have been developed by Impedans. In this presentation we will show dependent measurements of ion energy distribution, plasma potential, electron and ion density/flux and electron temperature data in pulsed and RF plasma illustrating the complex changes occurring when time modulation is used in plasma processes.

1:00pm **EW-WeL4 Modern e-Gun Evaporation Simplified for Research and Pilot Production Applications**, ***J. Moore***, *M. Ricks*, Thermionics Vacuum Products

Over the past 50 years electron beam sources have gone through numerous transformations. As the vacuum coating industry has evolved, electron guns have advanced from simple permanent magnet sources to sources with advanced magnetics and electromagnetic sweeping to meet the numerous application needs.

In the late 1980's, Thermionics' HM2 sources introduced discrete modular magnet technology which allowed beam shapes to be optimally configured for a process. This also provided a mechanism for advancing co-deposition making possible a source that could evaporate 6 materials simultaneously with complete independent control while maintaining extremely close crucible locations. The introduction of high frequency beam sweep helped to further increase the uniformity of the e-beam temperature making the sources more reliable

Modern sources such as the Thermionics' RC and HC e-Guns utilize traditional magnets with a series of modified pole extensions to create the effect of a discrete modular magnet source while still providing a "simple to service" source. Other features such as dual filament emitter assemblies and plug in emitter modules allow a high level of performance with minimum maintenance and technical expertise. This new generation of sources blend the past function oriented source with the modern high performance source allowing the average graduate student or research scientist access to the full spectrum of e-gun evaporation.

While sources have evolved, system technology has also been steadily moving forward. New systems incorporate hinged quick access doors and fully automated computer controls. Thermionics latest machine tools go one step further with cartridge loaded sources and sample holders. This new level of flexibility allows a research group to change process recipes in just minutes.

1:20pm **EW-WeL5 Modeling Electron Impact Collisions of Gas Mixtures Using Particle-in-Cell (PIC) Code**, ***S. Mahalingam***, *S. Veitzer*, *P.H. Stoltz*, Tech-X Corporation

We are developing a Monte Carlo Collision (MCC) model in VORPAL, a three-dimensional particle-in-Cell (PIC) plasma simulation code that will self-consistently model various types of electron impact collisions with a neutral gas (or) a combination of gas mixtures. The MCC model will include elastic (such as elastic scattering, and large-angle elastic scattering), inelastic (such as excitation, and ionization) and Bremsstrahlung collisions. A null collision technique is used for handling the electron impact collisions. The collision cross sections data are based on the Evaluated Electron Data Library (EEDL) dataset, which we obtained from the International Atomic Energy Agency Nuclear Data Services (IAEA NDS). The EEDL library contains collision cross sections and generation data for electrons and photons for atoms with Z = 1 – 100 for incident electron energies from 10 eV (or threshold) to 100 GeV. Additionally, we will enable the elastic scattering cross section data available for low incident electron energies (below 10 eV) from known measurements, so that the MCC model can be applied for studying the low temperature plasma problems. Users also have the option of specifying a user-defined model of the cross section. We will show simulation results for gases and parameters relevant to the plasma processes involved in the breakdown of metallic structures occurring in high-gradient RF cavity experiments.

*The work of Tech-X personnel is funded by the U. S. Department of Energy under Small Business Innovation Research (SBIR) Contract No. DE-FG02-07ER84833.

1:40pm **EW-WeL6 Near Ambient Pressure XPS - In Situ Surface Analysis Under Extreme Conditions**, ***A. Thissen***, SPECS GmbH, Germany

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