Monday, May 11

7:30 p.m. H-1 Patents on Plasma and Surface Engineering: Actual Trends in Patents, a Patent Database Study

R. Bethke, Fraunhofer Institute for Surface Engineering and Thin Films IST, Braunschweig, Germany; B. Rager, Fraunhofer-Gesellschaft, Muenchen, Germany; and W. Diehl, Fraunhofer Institute for Surface Engineering and Thin Films IST, Braunschweig, Germany

R&D is the key driver of innovation and an essential part to protect these developments is patent protection. Patent shield is both, a security against other competitors and an opportunity to seize market exclusivity for a novel product or treatment. The amount of patents on Plasma and Surface Engineering is certainly large and properly unstructured. Currently there is no data base regarding patents on Plasma and Surface Engineering available. To get global and detailed patent information a data base was developed for patents (World Wide) regarding Plasma and Surface Engineering. It was the aim to analyze the patents concerning global results like timeline, major designated countries, or applicants. Additionally, detailed patent analyses are possible. In the first part of the talk the methodology, the utilized databases as well as the analyzing tools will be explained. In the second part some results will be presented. Global patent activities relating to Plasma and Surface Engineering based on patents and applications, published from 1988 to 2008, were examined. The study presents key and emerging companies, universities and R&D-organizations, as well as historical and technological trends of patent activities. Furthermore, this lecture shows the results of geographic analysis and the separation in technology fields regarding different plasma applications.

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8:00 p.m. H-2 Voltage Control for Reactive Sputtering: Achieve Up to 10 Times the Typical Sputter Rate While Dramatically Reducing Input Power Requirements

D. Pelleymounter and K. Nauman, Advanced Energy Industries, Inc., Fort Collins, CO

In today's large-area thin-film vacuum-coating applications, vacuum pumps and power supplies typically consume the most energy. This is especially true for reactive processes. The best way to reduce incoming power requirements is to run high on the transition curve, but traditionally, this is very expensive and complicated. This presentation describes a simple solution that significantly reduces input power consumption, while dramatically increasing sputter rate: a power-supply voltage control feature. Although with its use, certain process issues must be addressed, voltage control is a simple method for achieving significant cost savings and high-quality, repeatable films.

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8:20 p.m. H-3 Process Benefits of Wide Area, Low Energy End-Hall Ion Source for Surface Pre-Cleaning and Functional Treatment of Polymeric Substrate Materials

J.M. Lackner and W. Waldhauser, Joanneum Research Forschungsgesellschaft m.b.H., Niklasdorf, Austria; L.J. Mahoney and J. Davis, Veeco Instruments, Inc., Fort Collins, CO; and G. Riess, University of Leoben, Leoben, Austria

The low ion energy and high current flux of broad-area gridless end-Hall ion sources can have significant advantages over high-energy gridded or gridless ion source systems when processing glass and engineering thermal plastics. Specifically the lower energy spectrum of such ion sources are shown to improve surface energy and adhesion with limited process exposure times and while inducing very limited optical, thermal or sub-surface layer damage which leads to mechanical embrittling, deformation and optical yellowing. We examine fundamental surface treatment properties of multiple materials (glass, silicon, polycarbonate, thermoplastic polyurethane, polytetrafluoroethylene, and polyethylene terephtalate) when processed under identical conditions in pure oxygen and argon-oxygen blends using contemporary end-Hall ion source technology. Surface energy, optical transparency, substrate thermal damage and FTIR spectral data of treated surfaces are reported along with adhesion performance of PVD sputtered titanium films. Optimal reduction in surface wettability is noted in all materials with the inclusion of 10-30% of oxygen with little to no change in optical transparency. In addition to these results, typical treatment rates are deduced against ion beam current dosage to help process developers scale end-Hall ion source systems to various wide-area batch and in-line vacuum treatment applications.

Monday, May 11

8:40 p.m. H-4 Technology and Industrial Applications of Film 3D Characterization

S. Han, Vecco Instruments, Inc., Tucson, AZ

Transparent films are playing an increasingly important role in modern industry because films are critical components of many high technology industries such as photovoltaics, medical implants, thin-film batteries, flexible displays, advanced semiconductors and MEMS. Film designers are providing tightly toleranced designs to manufacturers and they, in turn, are challenged to consistently meet the required quality in various applications. In order to get the best product, however, proper film inspection is a key requirement. Ellipsometers can measure film thickness at a single spot or over a small field of view. Stylus techniques can inspect the thickness on a line-by-line basis as long as an edge is available. Three dimensional inspection techniques are increasingly required to control the process over large areas and provide both surface and film thickness information from a single system. In this presentation, interference techniques for film metrology using white light will be described. The technique provides 3D top surface, interface and thickness profiling. For thick (above 2um) and thin film, different signal analysis techniques are required. Various measurements will be presented illustrating the capabilities of the technique and the needs of several applications spaces discussed.

Monday, May 11

9:00 p.m. H-5 Important Developments in Pulsed Cathodic Arc Deposition

R. Chistyakov and B. Abraham, Zond Inc./ZPulser, LLC, Mansfield, MA

A new method of generating pulsed cathodic arc discharge was developed. In order to ignite and sustain the arc discharge, a voltage pulse output with sharp voltage oscillations was applied between cathode and anode. The typical pulse duration was in the range of 500-3000 μs. During the experiment, it was found that the growth of the arc current can be controlled by changing the voltage rise time and the amplitude of these oscillations. By applying different voltage oscillations in a single pulse, it was found that the arc discharge current can be controlled. OES spectrums for pulsed arc discharge with aluminum, titanium/aluminum, and carbon targets in either pure oxygen or oxygen/argon atmospheres will be presented. Voltage and current waveforms with different voltage oscillations will be discussed. SEM images of aluminum oxide films deposited with voltage a pulse duration of 1000 μs will be presented. By controlling the voltage rise time of the voltage oscillations in the beginning of the pulse, a new mode of arc discharge for titanium/aluminum target (50/50)% was observed. This new method increases ionization of the evaporated material and should help to control the size of macro particles when compared with conventional continuous arc discharge.