Wednesday Lunch, November 2, 2005

Exhibitor Workshop
Room Exhibit Hall C&D - Session EW-WeL

XPS and SPM New Developments and Applications
Moderator: C. Bryson, Apparati, Inc.

12:00pm **EW-WeL1 Improvement of the Quantification from XPS Data Using Predetermined Spectrometer-Transmission Functions with UNIFIT 2004***, R. Hesse, P. Streubel, R. Szargan,* University of Leipzig, Germany

The reliability of the quantification from XPS data was improved using calibrated intensity scales of the photoelectron spectrometer ESCALAB 220 iXL. Two different sub-routines, survey-spectra approach (SSA) and minimizing the error of the quantified peak-area approach of standard peaks (QPA), for estimating the transmission functions T(E) of different acquisition modes of any photoelectron spectrometers are integrated in the software UNIFIT 2004. For the method SSA the spectra from Au, Ag and Cu measured on the Metrology Spectrometer II of NPL have been used. The estimation of T(E) using the method QPA was carried out by means of the peak areas from Au 4f, Au 4d, Au 4p@sub 3/2@, Ag 3d, Ag 3p@sub 3/2@, Cu 3p, Cu 2p@sub 3/2@, Ge 3d and Ge 2p@sub 3/2@ lines measured for Mg K@alpha@ and Al K@alpha@ X-rays. The theoretical basis of quantification as well as the results of the transmission functions T(E) (E - kinetic energy) of the spectrometer have been considered for both approaches SSA and QPA.. In the presented paper the influence of pass energies (10 eV and 50 eV), lens modes (Large Area, Large Area XL, Small Area 150) and X-ray sources (Al/Mg-twin and Al-mono) on T(E) is discussed. It was found that the form T(E) = a+bE@super c@ (a, b, c - parameters) gives an appropriate approach to describe T(E) of the studied spectrometer modes in many cases. In order to demonstrate the applicability of the calculated functions T(E), a quantitative analysis of the sample Ni90Cr10 was performed. Keyword: UNIFIT, Spectrum analysis software, Photoelectron spectroscopy, Quantification, Transmission function, Intensity/energy response function.

12:40pm **EW-WeL3 Latest Development in Environmental Scanning Probe Microscope - Membrane of a HELA Cancer Cell***, S. Xu, **C. Wall**,* Molecular Imaging Corp.

The presentation will focus on the following topics: a) the environmental AFM application in chemistry, material science and biomaterial research; b) Nanografting: fabrication of nanometer size patterns using AFM and the potential application in development of biosensors; c) Post-imaging data processing, data rendering and analytical techniques; d)nanometer level mechanical testing application in biological materials. Many experiments benefit from imaging under controlled conditions: for biological applications imaging at 37 C is often crucial and controlled gas environments (oxygen, carbon dioxide etc) is frequently required. Electrochemical measurements are carried out in solution, mostly at the absence of dissolved oxygen, polymer studies are affected by humidity and temperature. In-situ real time "nano-movies" can be taken at programmed changing temperature between -40 C to +250 C. Various experimental results will be discussed using versatile imaging modes and under wide range of environmental controlling techniques. The concept of AFM nanolithography includes a list of surface chemistry reactions that could be used to create nanometer level patterns using atomic force microscope. Fabrication of nanometer size patterns attracted tremendous attention because patterned surfaces can be used as the building block for a wide range of research in developing biological sensors, nanodevices and masks for fabrication of nanoelectronics. Through chemically active nanopatterning, surfaces can be engineered with nanoscale spatial resolution. The concept of NanoGrafting includes a wide range of SPM assisted nanolithography techniques which could yield nanometer size patterns with desired chemical functionality on a variety of substrates. AFM images not only give a topographic view of the sample surface with high resolution, post-imaging processing can also allow researchers to extract more quantitative information of the experiments. Skillful data rendering not only can help the enhancement of spatial resolution, using Texture Mapping, advanced imaging mode data can be displayed with much more informative format and striking clarity.

1:00pm **EW-WeL4 Dynamic Scaling during Shadowing Growth of Ru Nanorods***, **L. Li**, F. Tang, T. Karabacak, G.-C. Wang, T.-M. Lu,* Rensselaer Polytechnic Institute

We present a comprehensive study of dynamic scaling behavior of ruthenium nanorods grown by oblique angle sputter deposition with substrate rotation. The vertical nanorod arrays with various lengths (~ 40 to ~ 480 nm) were grown on silicon substrates tilted with an angle ~85° from the surface normal of the sputtering target. The images of the nanorods were obtained by atomic force microscopy (AFM) and scanning electron microscopy (SEM). The images were analyzed using morphological analysis methods including power spectral density and autocorrelation functions. We observed that the Ru nanorods generated a quasi-periodic structure defined by a wavelength (@lambda@) as a result of shadowing effect. Moreover, the wavelength @lambda@, rod number-density N, rod diameter W, root-mean-square roughness @omega@, and lateral correlation length @xi@ (which measures an average distance within which the surface heights are correlated and is different from the wavelength) all change with rod height h according to a power law relationship, ~h@super p@, with exponents p@sub &lambda@ = 0.43 ± 0.02, p@sub N@ = -1.01 ± 0.02, p@sub W@ = 0.47 ± 0.09, p@sub &omega@ = 1.11 ± 0.01, and p@sub &xi@ = 0.55 ± 0.02, respectively. The measured values of the exponents p@sub W@, p@sub &omega@, and p@sub &xi@ are consistent with the results of theoretical models on oblique angle growth that include the effects of shadowing effect and isotropic surface diffusion. However, the exponents p@sub &lambda@ and p@sub N@ are not predicted by any previously known growth models. @FootnoteText@ F.T. is the recipient of the Harry Meiners Fellowship.

1:20pm **EW-WeL5 A New Approach to SPM Control Electronics***, **M. Maier**, B. Uder,* Omicron NanoTechnology, Germany

We developed a control system that couples advances in digital electronics with the requirements of the latest SPM applications to offer an extremely high level of experimental flexibility and data processing control. Fundamental to its modular philosophy are a series of advanced digital boards each equipped with CPU, DSP and logic elements. Programmable elements are "soft-wired" opening up to new functionality such as multi-channel feedback, input/output trigger control, pre-emptive feedback, and non-orthogonal and non-linear scan generation.

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