Microscopy & Microanalysis '98

Sponsored by the Microscopy Society of America, and the Microbeam Analysis Society - July 12-16 at the Georgia World Congress Center, Atlanta

There will be over 600 papers and posters on the 1998 program, including papers categorized as Advances in Instrumentation and Techniques, and both Applications of Microscopy and Microanalysis in the Biological Sciences, and Applications of Microscopy and Microanalysis in the Physical Sciences.

Special events will include:

➡ The Multi-Photon Excitation Symposium and Workshop, which will include two full days of lectures with hands-on workshop sessions on multiphoton instruments during the afternoon. The organizer is Jim Pawley.

➡ Problem Solving With the Experts, organized by Ron Anderson and Jose Mascorro.

➡ Tutorials, organized by James Turner and John Mansfield, including Deconvolution of Biological Images for 3D Light microscopy - Confocal and Widefield; AFM and other Scanned Probe Microscopies; TEM Specimen Preparation in the Physical Sciences; Miniaturized Artificial Machines in Biology and Medicine; Applications of Nano- and Microfabrication; and Problem Elements and Spectrometry Problems in X-ray Microanalysis; and The Black Holes of the Periodic Table.

➡ Short Courses, organized by Brian Herman and Louis Kerr, including: Basic Transmission Electron Microscopy for Materials Science; Gold Labeling Workshop; Practical Digital Imaging; The Digital Darkroom; The Use of Microwave and Digital Imaging Technology in Microscopy; Solutions for Tomorrow's Problems in Today's Laboratories; and Traditional and Electronically-Enhanced Polarized Light Microscopy.

➡ Technologists Forum - Round Table discussion: Manipulation and Enhancement of Acquired Images; Photoshop 101, organized by Sandy Silver; and the ever popular Computer Workshop and Software Exchange, organized by Nestor Zaluzec and John Mansfield.

An Opening Reception and annual M&M golf tournament on Sunday, and a Wednesday night dinner at beautiful Stone Mountain park, are scheduled. Many tours of attractions surrounding Atlanta, have been organized by the Local Arrangements Committee, chaired by Janet Woodward.

For more information about attending or exhibiting, contact Annamarie Dowling at (708)361-6000, Fax: (708)361-6166, eMail: LindaCG123@aol.com

The Microscopist Salary Survey

In our last issue, we announced a salary survey for U.S. microscopists. But, unfortunately, we made a (dumb) error and did not ask for the number of years experience.

If you responded and **did not** include this information, please respond again - with our most sincere apologizes.

And if you have not responded, please do so. We are hoping for some 1,500 replies - which should provide salary summary information of real value to a number in the industry.

The correct form is included on page 22 of this issue.

... Don Grimes, Editor

Methods To Identify Contaminants On Photoresists

Wesley Nieveen, Surface Science Laboratories

Contaminants on photoresist can be difficult to identify, especially if they are very thin, *e.g.*, less than 0.5 µm. It is very doubtful at the 0.2 µm realm that histological or optical microscopy methods will work. There are several methods available to identify such contaminants, each giving different degrees or type of information about contaminants.

1) The "simplest" method is Fourier Transform Infrared Spectroscopy (FTIR). However, "simple" is perhaps not the best choice of words. Depending on contaminant film thickness, using FTIR with Attenuated Total Reflection (ATR) multi-reflection, it may be possible to "see" the film, but the photoresist background will need to be dealt with (a non-trivial matter). FTIR would require a substantial lateral size of the contaminant, say 100 µm or more for this technique to work. The FTIR would not identify a specific organic contaminant *per se*, and would not identify a biological one.

2) Electron Spectroscopy for Chemical Analysis (ESCA), also called X-ray Photoelectron Spectroscopy (XPS), is very good at analyzing very thin films. Depth of information for XPS is about 100 Angstroms (0.01 µm). The lateral information area is at best about 10 µm (50-75 µm is more typical). It can detect all elements greater than He at concentrations of about 0.1-1.0%. and give quantitative results (the accuracy depends on the standards used, etc.). ESCA/XPS can also give some chemical state information, *e.g.*, nitrogen as azide versus nitride, carbon as CF_x versus carbide, etc. This can be extremely useful, but chemical state information is not completely unambiguous. ESCA/XPS requires ultra-high vacuum ($<10^{-9}$ torr) and samples must be compatible. Photoresist should not be a problem, but if a contaminant has high volatility or is very hydrated (such as a biological), then this method may not work as is.

3) Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF SIMS) is a mass spectrometry method with extreme surface sensitivity. TOF information comes from the top 2-3 monolayers of a sample and can easily see films of one monolayer or mono-atomic thickness. Mass resolution is good (typically $M/\triangle M = \sim 10{,}000$) and spatial (lateral) resolution is reasonable (about 0.2 µm) but not both simultaneously.

TOF also requires ultra-high vacuum, but a cold stage (offered by one or two of the TOF manufacturers) can work with volatile and somewhat hydrated samples. Specific identification *may* be possible with TOF. Information from TOF represents molecular/elemental mass fragments from the surface. Complex organics can often be identified (with standard) and "reverse assembly" of molecular mass fragments can sometimes be done to yield the parent molecule. TOF has excellent elemental/molecular sensitivity, with some elements detected at the parts per billion range or lower.

Caveats: The FTIR method, although more commonly available, is the least likely to work, especially if the film is very thin and in small spots. FTIR for this application requires a very skilled analyst (A routine lab guy is not likely to be successful, even if there is enough material to do the job). You also need a high quality machine (a really good FTIR with an IR microscope, multi-pass ATR cell, etc.) to match your highly skilled analysis.

ESCA/XPS is an expensive technique (Instruments usually cost about $400,000) and requires an experienced operator. Commercial analytical laboratories are probably the best bet if this needs to be done. Cost for this analysis would probably run from $450-$1,500, depending on what is needed from the analysis. TOF instruments are even more expensive (typically $600,000) and require very skilled, experienced analysts. There are not very many of these machines around the country. Commercial analytical labs are your only real choice here. Analysis would probably run around $750-$1,000. ■