Materials Research Society Fall Meeting at the John B. Hynes Veterans Memorial Convention Center in Boston

MRS 2012, Boston, MA conference

Symposium YY: Low-Voltage Electron Microscopy and Spectroscopy for Materials Characterization

November 25-30, 2012 - Boston, Massachusetts - Zeiss SMT, CEOS Heidelberg, Delong America Inc., and FEI Electron Optics have sponsored the Low Voltage Electron Microscopy ad Spectroscopy for Materials Characterization Symposium organized by Ute A. Kaiser (Ulm University), Lawrence F. Drummy (Air Force Research Laboratory), and David Joy (University of Tennessee) at the MRS Fall Meeting & Exhibit in Boston, Massachusetts from November 25th - 30th 2012. In this Symposium it was discussed that many future materials systems and devices will have nanoscale-active components which are composed of organic and/or inorganic matter, and that characterization techniques with the ability to directly image these materials with high resolution and high contrast are currently needed. Low-voltage electron microscopy (LVEM) has seen tremendous growth in recent years due to the increased elastic and inelastic scattering contrast at low voltage. While low voltage is traditionally associated with reduced spatial resolution, with new generations of spherical aberration correctors, ~2 Å resolution atomic lattice imaging at 20 kV accelerating voltage is now possible. As an example, the properties of materials such as carbon nanostructures and graphene are highly dependent on local bonding and atomic scale defects; however, direct visualization of these features has, to date, been limited by the knock-on beam damage and low contrast associated with high-voltage electron microscopy. LVEM has the potential to address these challenges by reducing knock-on damage, increasing imaging contrast, and improving spectroscopic efficiency.

In addition to high contrast for imaging, the increased total scattering at low voltage also allows for improved signal to noise in analytical techniques such as electron energy loss spectroscopy. However, in conjunction with the increased scattering comes an increase of other electron beam damage effects such as ionization and heating for polymers, organic molecular solids, and biological materials. As such, experimental and theoretical analysis of electron beam-matter interactions at low voltages has been an important topic in this symposium. The symposium was open to submissions on theory and experiments in both scanning and transmission low-voltage electron microscopy, spectroscopy, LV data visualization and modeling, as well as new sample preparation strategies.

Session topics included:
- Low-voltage TEM, STEM, and SEM
- Aberration correction at low voltage
- Analytical techniques in low-voltage electron microscopy
- Electron beam damage
- Low-energy electron diffraction
- Low-voltage imaging of soft materials and carbon-based materials

A joint session with Symposium W: Carbon Nanomaterials has been carried out.

Organizers:
Ute A. Kaiser, University of Ulm
Lawrence F. Drummy, Air Force Research Laboratory

Sponsors:
Carl Zeiss AG
CEOS GmbH
Delong America Inc.
FEI Company

WORKSHOP participants

Participants	Institutions
Egerton, Raymond F.	University of Alberta
Bassim, Nabil D.	Naval Research Laboratory Washington
Larychevskaia, Tatiana	Physics Institute Zurich
Kisielowski, Christian F.	Lawrence Berkeley National Laboratory
Martin, Aiden A.	University of Technology Sydney
Martin, David C.	The University of Delaware
Deschler, Felix	Ludwig-Maximilians-University Munich
Golla-Schindler, Ute	University of Ulm
Rose, Harald H.	University of Ulm
Haider, Max.	CEOS company
Drummy, Lawrence F.	Air Force Research Laboratories Wright-Patterson
Kamimura, Osamu	Hitachi company
Mankos, Marian	Electron Optica company
Longchamp, Jean-Nicolas	Physics Institute Zurich
Westenfelder, Benedikt	University of Ulm
Houben, Lothar	Ernst Ruska-Centre
Kurasch, Simon	University of Ulm
Zoberbier, Thilo	University of Ulm
Liu, Jinglin	University of Delaware
Umezawa, Kenji	Osaka Prefecture University
Libera, Matthew	Stevens Institute of Technology
Chen, Jihua	Oak Ridge National Laboratory
Wachsmuth, Philipp	University of Ulm
Krivanek, Ondrej L.	NION company
Zhou, Wu	Vanderbilt University
Suenaga, Kazu	AIST Tsukuba
Calderon, Hector A.	ESFM-IPN Mexico DF
Yedra, Lluis	University of Barcelona
Schroeder, Rasmus R.	University of Heidelberg
Chen, Jihua	Oak Ridge National Laboratory
Kaiser, Ute A.	University of Ulm
Lee, Zhongbo	University of Ulm
Zuo, Jian Min	University of Illinois at Urbana-Champaign
DeGraef, Marc	Carnegie Mellon University Pittsburgh
Lifshin, Eric	University of Albany
Cachau, Raul E.	Frederick National Laboratory for Cancer Research
Jiang, Kaili	Tsinghua-Foxconn Nanotechology Research Center Beijing
Bayer, Bernhard C.	University of Cambridge
Picher, Matthieu	NIST Gaithersburg
Boeckl, John J.	Air Force Research Laboratories Wright-Patterson
Idrobo, Juan C.	Oak Ridge National Laboratory
Allali, Naoual	LCPME Villers-les-Nancy
Wang, Wei L.	Harvard University