

Name: James C. Mabon

Research fields of interest and experience:

- General materials characterization, emphasizing micro/nano-analytical techniques.
- Currently specialized in electron microscopy and focused ion beam techniques.
- Instrumentation and technique development for micro/nano analysis.
- Material Science interests/background include thermodynamics and phase relations, phase transformations and kinetics, strengthening mechanisms, structure/property relationships, and modeling/computer applications to materials science.
- Materials Processing.
- Web application and instrumentation software development.

My research experience and interests over time have encompassed many varied aspects of material science from extractive and physical metallurgy, electrochemistry and corrosion, thin films, oxide materials, semiconductor materials, device fabrication and characterization, and soft/bio materials. My primary interest is the application and development of micro/nano-analytical techniques for the solution of engineering or scientific problems in material science.

I have over 37 years' experience in electron microscopy starting from my first hand's on courses in scanning electron microscopy and transmission electron microscopy in undergraduate school, to using electron microscopy extensively in my graduate work on black oxide coatings and uranium alloys, as a Microanalysis Group staff member at the Department of Energy's Y-12 plant in Oak Ridge, TN, and here in the University of Illinois MRL's Central Research Facilities.

My electron microscopy expertise includes Transmission Electron Microscopy (TEM, STEM, aberration corrected STEM, EDS, EELS, SAED, NBD, CBD), Scanning Electron Microscopy (EDS, WDS, CL, EBSD, TKD, EBIC), Focused Ion Beam (TEM sample prep, cross-section imaging, nano-fabrication, nano-patterning serial section imaging and 3D reconstruction). I also have extensive experience with sample preparation for TEM, SEM, and metallography including mechanical polishing, electro-polishing, ion beam techniques, etching, etc.. My interest in technique development interests include new or novel techniques or capabilities incorporated with electron microscopy or focused ion beam methods. This could range from implementing, testing, and documenting a known technique to make it available for facility users to designing hardware to implement a technique, or working on a new technique. I also have experience with Electron Beam Lithography, X-ray powder diffraction, Auger Electron Spectroscopy, X-ray Photoelectron Spectroscopy, Secondary Ion Mass Spectroscopy, Atomic Force Microscopy, Optical Microscopy and image processing/analysis. I also have strived to become knowledgeable of any related or new techniques to my areas of interest as I become aware of them. I also have been involved with the selection, purchase, and/or commissioning of every electron microscope currently in the MRL facilities.

I have been a web application and software developer for several projects. Examples include the DoE funded Material Microcharacterization Collaboratory Pilot Project (MMC) at UIUC (served as principal investigator) which developed remote viewing and/or control access to several instruments; designed and developed the user management/instrument reservation schedule system and user proposal system in MRL (still the basis for system in use today); developed an intranet document library system for CMM; worked with Jim Zuo to develop a web-based interface to electron diffraction and image simulation software (WebEMAPs); developed user-friendly software for nanoscale patterning and fabrication in the DB-235 FIB, designed and developed a stage motorization system for the PHI 660 Auger; reverse engineered and developed Windows Software to control an XRF instrument.

Instrumentation/core of responsibility within the MRL:

All facets of Electron Microscopy and Focused Ion Beam Instrumentation available at MRL.

Other instruments qualified to operate:

E-beam Lithography, Optical Microscopy, Nano-mechanical Property Instruments, Auger electron spectroscopy, X-ray Photoelectron Spectroscopy, Atomic Force Microscopy, powder XRD

Education:

New Mexico Institute of Mining and Technology	Metallurgical Engineering	B.S. (1980)
New Mexico Institute of Mining and Technology	Metallurgy	M.S. (1983)
New Mexico Institute of Mining and Technology	Material Science	Ph.D. (1991)

Appointments (Professional experience):

2012-present	Senior Research Scientist, Frederick Seitz Materials Research Lab, University of Illinois, Urbana, IL
1997-2011	Research Electron Microscopist, Frederick Seitz Materials Research Lab, University of Illinois, Urbana, IL
1993-1996	Development Staff Member, Microscopy and Microanalysis Group, Development Division, Lockheed Martin Energy Systems, Y-12 Plant, Oak Ridge, TN
1991-1993	Development Associate, Microscopy and Microanalysis Group, Development Division, Lockheed Martin Energy Systems, Y-12 Plant, Oak Ridge, TN
1990-1991	Materials Science Characterization Lab Manager, New Mexico Institute of Mining and Technology, Socorro, NM

Selected publications:

- Wenpei Gao, Jianbo Wu, Hyuk Park, J. Mabon, W.L. Wilson, Hong Yang, Jian-Min Zuo, “In Situ Observation of Pt Icosahedral Nanoparticles Transformation into FCC Single Crystal”, (2016) *Microscopy and Microanalysis*, 22 (3), pp. 766-767 [DOI:10.1017/S1431927616004682](https://doi.org/10.1017/S1431927616004682)
- Yang, W., Mao, S., Yang, J., Shang, T., Song, H., Mabon, J., Swiech, W., Vance, J.R., Yue, Z., Dillon, S.J., Xu, H., Xu, B., “Large-deformation and high-strength amorphous porous carbon nanospheres”, (2016) *Scientific Reports*, 6:24187 [DOI: 10.1038/srep24187](https://doi.org/10.1038/srep24187)
- Aram Yoon, Wenpei Gao, Jianbo Wu, Hyuk Park, J. Mabon, W.L. Wilson, Jian-Min Zuo, “Materials processes observed using dynamical environmental TEM at University of Illinois”, (2015) *Microscopy and Microanalysis*, 21 (3), pp. 2323-2324 [DOI:10.1017/S1431927615012398](https://doi.org/10.1017/S1431927615012398)
- Pogue, E., Wilson, S., Mabon, J., Anderson, T., Teeter, G., Hall, A., Rockett, A., “Cryo-cathodoluminescence study of Cu₂ZnSnS₄ thin films”, (2015) 2015 IEEE 42nd Photovoltaic Specialist Conference, PVSC 2015 [DOI: 10.1109/PVSC.2015.7355596](https://doi.org/10.1109/PVSC.2015.7355596)
- Zuo, D., Liu, R., Wasserman, D., Mabon, J., He, Z.-Y., Liu, S., Zhang, Y.-H., Kadlec, E.A., Olson, B.V., Shaner, E.A., “Direct minority carrier transport characterization of InAs/InAsSb superlattice nBn photodetectors”, (2015) *Applied Physics Letters*, 106 (7) [DOI: 10.1063/1.4913312](https://doi.org/10.1063/1.4913312)
- Chen, X., Zuo, D., Kim, S., Mabon, J., Sardela, M., Wen, J., Zuo, J.-M., “Large area and depth-profiling dislocation imaging and strain analysis in Si/SiGe/Si heterostructures”, (2014) *Microscopy and Microanalysis*, 20 (5), pp. 1521-1527. [DOI: 10.1017/S1431927614012963](https://doi.org/10.1017/S1431927614012963)
- Gao, W., Wu, J., Zhang, X., Yoon, A., Mabon, J., Swiech, W., Wilson, W.L., Yang, H., Zuo, J.-M., “Surface atomic diffusion processes observed at milliseconds time resolution using environmental TEM”, (2014) *Microscopy and Microanalysis*, 20 (3), pp. 1590-1591 [DOI: 10.1017/S1431927614009684](https://doi.org/10.1017/S1431927614009684)

- Jianguo Wen, James Mabon, Changhui Lei, Steve Burdin, Ernie Sammann, Ivan Petrov, Amish B. Shah, Varista Chobpattana, Jiong Zhang, Ke Ran, Jian-Min Zuo, Satoshi Mishina, Toshihiro Aoki, “The formation and performance of sub-Angstrom to nanometer-sized electron probes using the aberration corrected JEOL 2200FS Transmission Electron Microscope at the University of Illinois”, *Microscopy and Microanalysis*, 16, 183-193 (2010) [DOI: 10.1017/S1431927610000085](https://doi.org/10.1017/S1431927610000085)
- Kumar, A., Fung, K.-H., Mabon, J.C., Chow, E., Fang, N.X., “Excitation and imaging of resonant optical modes of Au triangular nanoantennas using cathodoluminescence spectroscopy”, *Journal of Vacuum Science & Technology B*, 28, C6C21-C6C25 (2010) [DOI: 10.1116/1.3504566](https://doi.org/10.1116/1.3504566)
- Cai, W., Mabon, J., Bellon, P., “Crystallographic textures and texture transitions induced by sliding wear in bronze and nickel”, *Wear*, 267:1-4, 485-94 (2009) [DOI: 10.1016/j.wear.2008.11.016](https://doi.org/10.1016/j.wear.2008.11.016)
- Chen, Z., Mabon, J., Wen, J.-G., Trice, R., “Degradation of plasma-sprayed yttria-stabilized zirconia coatings via ingress of vanadium oxide”, (2009) *Journal of the European Ceramic Society*, 29 (9), pp. 1647-1656. [DOI: 10.1016/j.jeurceramsoc.2008.10.003](https://doi.org/10.1016/j.jeurceramsoc.2008.10.003)
- Wu, X., Pan, X., Mabon, J.C., Li, M., Stubbins, J.F., “An EBSD investigation on flow localization and microstructure evolution of 316L stainless steel for Gen IV reactor applications”, (2007) *Journal of Nuclear Materials*, 371 (1-3), pp. 90-97 [DOI: 10.1016/j.jnucmat.2007.05.028](https://doi.org/10.1016/j.jnucmat.2007.05.028)
- Pratik Chaturvedi, Keng Hsu, Anil Kumar, James C. Mabon & Nicholas Fang, “Imaging of plasmonic modes of silver nanoparticles using high-resolution cathodoluminescence Spectroscopy”, *ACS Nano*, 3:10, 2965-74 (2009) [DOI: 10.1021/nn900571z](https://doi.org/10.1021/nn900571z)
- Kim, H., Schuette, M., Jung, H., Song, J., Lee, J., Lu, W., Mabon, J.C., “Passivation effects in Ni/AlGaN/GaN Schottky diodes by annealing”, (2006) *Applied Physics Letters*, 89 (5) [DOI: 10.1063/1.2234569](https://doi.org/10.1063/1.2234569)
- Zuo, J.M., Mabon, J.C., “Web-based electron microscopy application software: Web-EMAPS”, *Microscopy and Microanalysis*, 10:SUPPL. 2, 1000-1 (2004) [DOI: 10.1017/S1431927604884319](https://doi.org/10.1017/S1431927604884319)
- Mabon, James C., Gernot Metze, and Ivan Petrov. “Materials Microcharacterization Collaboratory” DoE Report No. DOEER25328-1, University of Illinois, Urbana, IL (US), 2003 [DOI:10.2172/807949](https://doi.org/10.2172/807949)