Richard J. Matyi, Ph.D.

MidFlorida Materials & Characterization LLC
2323 Sebago Drive, Lakeland FL 33805-8008

Phone: (518) 641-8525 e-mail: rmatyi@midflmaterials.com URL: www.midflmaterials.com

Professional qualifications

- ⇒ Over 40 years direct experience in the growth, characterization, and utilization of the major materials classes – metals, ceramics, semiconductors and polymers – with hands-on experience in virtually all modern tools for materials analysis
- ⇒ Deep knowledge of` X-ray science and technology as applied to the characterization and analysis of materials. Specific methods include powder X-ray diffraction, texture and preferred orientation, small-angle X-ray scattering, high resolution methods (double- and triple-axis diffraction), size/strain determinations, and in-plane diffraction methods.
- ⇒ Internationally recognized expert in X-ray analytical tools used in materials analysis with a particular emphasis on high resolution X-ray diffraction and X-ray reflectometry methods – established high resolution X-ray diffraction capabilities at SUNY – Albany (Bruker D8) and Florida Polytechnic (Rigaku SmartLab) and instituted multiple collaborative research programs with academic and industrial collaborators for utilizing high resolution X-ray diffraction methods for the analysis of defects in bulk and thin film semiconductors as well as inorganic and organic crystals.
- ⇒ More than 30 years direct experience in semiconductor materials processing with an emphasis on growth and surface modification techniques, including wafering methods, chemical-mechanical polishing, reactive ion etching, ion implantation (including shallow junction doping), metallization (PVD and CVD) and epitaxial growth (both homo- and heteroepitaxy) by MOCVD and MBE
- ⇒ Successful record of scientific program development and materials research in industry, academia, and the U.S. government; 3 U.S. patents issued for semiconductor thin film deposition methods and two Standard Reference Materials created.
- ⇒ Demonstrated ability to manage multiple research programs simultaneously, including the effective control of budgets, capital equipment, and personnel, with a record of successful proposal preparation; also experienced with both leading and participating in international collaborations
- ⇒ Excellent writing and oral skills: author or co-author of 190 scientific publications as well as 7 book chapters and one book in preparation; presenter of over 130 talks (50+ invited) at technical meetings and colloquia; teacher and lecturer at professional workshops and to freshman through graduate level university students
- ⇒ Deep and broad experience in teaching all levels of science and engineering to students ranging from college freshmen to Ph.D. graduate students. Classroom teaching experiences have spanned the entire range of materials science and engineering along with instruction in physics (including quantum mechanics and solid-state theory) and aspects of related engineering disciplines.
- ⇒ Widely regarded as a knowledgeable and passionate university teacher. Highly knowledgeable of curriculum development and course and program assessment. Teaching capabilities have recently expanded to on-line teaching and enabling student learning via remote platforms.
- ⇒ Experienced in personnel and program management, including hiring (domestic and foreign students and technicians for laboratory research), training, supervision, and performance evaluation
- ⇒ Broad experience in allied technical fields from university research and teaching and from active participation in a many successful, cross-disciplinary collaborative programs

Education

Northwestern University, Evanston, IL – Ph.D. in Materials Science and Engineering, 1983
Dissertation: "Characterization of a Silica-Supported Iron Catalyst – Particle Size Distribution and Local Temperature Effects" (L.H. Schwartz and J.B. Butt, thesis advisors)

Massachusetts Institute of Technology, Cambridge, MA – S.M. in Polymerics, 1976
Dissertation: "Microstructure of Epoxy Resins" (D.R. Uhlmann, thesis advisor)

Northwestern University, Evanston, IL – B.S. in Materials Science and Engineering, 1975

Professional experience and accomplishments

MidFlorida Materials & Characterization LLC, Lakeland, FL (2021 – present)
Principal Officer

Providing professional services in materials research, analysis and characterization, and STEM education. A partial list of current activities includes the following:

- Serving as Consultant for a major law firm to provide subject matter expertise in materials-related inssues associated with ongoing litigations [*details protected by professional services agreement*]
- Provided subject-matter expertise in nanotechnology to a medical device company as part of an ongoing application for approval process by the U.S. Food and Drug Administration [*details protected by an executed non-disclosure agreement*]
- Providing specific support via contract research to the solution of materials-related manufacturing issues (primarily using materials analysis and characterization strategies) for a variety of industries
- Writing and producing of the textbook *Characterization of Nanostructured Materials – A Users Guide* (currently under contract to Springer Nature) to accompanying classroom and laboratory instruction in materials analysis, characterization, and metrology

SUNY Polytechnic Institute, State University of New York, Albany, NY (2021 – present)
Courtesy Adjunct Appointment, College of Nanoscale Science and Engineering

Tasked with developing instructional framework and curricular materials for on-line continuing education efforts. Specific activities include the development of Microcredential programs to provide industry-aligned skills and competencies in semiconductor materials technology; also involved in the development of the M.S. in Advanced Technology (MSAT) program with a focus in Semiconductor Processing and Nanomanufacturing Technology.

Florida Polytechnic University, Lakeland, FL (2015 – 2021)
Associate Professor, Mechanical Engineering Department

Joined the newly-minted Florida Polytechnic in its second year of instruction to participate in the growth of a new primarily undergraduate STEM educational environment.

Specific accomplishments:

- *Essential development in the teaching environment of Florida Polytechnic University* – Served as the initial Academic Program Coordinator for Mechanical and Industrial Engineering and worked on curriculum development, classroom delivery, faculty hiring activities, and facility development
- *Online instruction for STEM education*: Developed and implanted materials and methods for effective online STEM undergraduate instruction, including the development of a novel process for teaching laboratory concepts and content in a fully on-line teaching environment.

- *Nanotechnology teaching and research*: Tasked with leading the nanotechnology effort at Florida Polytechnic University. Responsibilities include establishing laboratory capabilities and infrastructure for nanotechnology research; developing curricular resources for undergraduate academic programs; and outreach to regional industrial partners for collaborative R&D programs.
- *Teaching laboratory methods to undergraduate students*: Established a comprehensive X-ray diffraction facility at Florida Polytechnic including multiple table-top X-ray diffractometers, X-ray fluorescence, and a state-of-the-art multi-poerformance X-ray diffractometer (Rigaku SmartLab) for introductory and advanced teaching and research applications.

University at Albany/SUNY Polytechnic Institute,
State University of New York, Albany, NY (2004 – 2015)
Professor (tenured) , College of Nanoscale Science and Engineering

Responsible for the development of fundamental and applied research programs involving metrology, materials modification, and materials analysis for semiconductor manufacturing and nano-materials development, as well as teaching and curriculum and education development in nanotechnology.

Specific accomplishments:

- *High resolution X-ray diffraction analysis of materials:* Established a high resolution X-ray diffraction capability at SUNY – Albany and have instituted multiple collaborative research programs with academic and industrial partners for utilizing high resolution X-ray diffraction methods for the analysis of defects in materials ranging from bulk and thin film semiconductors to inorganic and organic materials
- *Critical dimension small-angle X-ray scattering (CD-SAXS) for semiconductor metrology:* Worked as a member of a university/industry collaboration to develop CD-SAXS as a viable tool for advanced semiconductor processing metrology. Specific issues addressed included the development of novel high-brightness X-ray sources and establishing the reliability of CD-SAXS for manuvacturing metrology.
- *Graduate curriculum development in nanotechnology:* Headed the CNSE effort to establish a new "Foundations of Nanotechnology" modular first-year graduate curriculum that would be suitable for graduate students matriculaling from diverse scientific and engineering backgrounds.
- *Undergraduate curriculum development:* Responsible for the coordinated establishment of the under-graduate curricula leading to the B.S. degrees in Nanoscale Science and in Nanoscale Engineering. Also responsible for setting up the assessment and other processes required for the subsequent successful ABET accreditation of the Nanoscale Engineering undergraduate degree program.
- *Software development for X-ray characterization and metrology*: Collaborated with instrument vendors on the development, verification, and troubleshooting of software used in X-ray analytical systems.
- *International collaborations*: Director of the CNSE's collaboration with the Centro de Investigación en Materiales Avanzados, Chihuahua, Mexico; also actively participating in the Versailles Project on Advanced Materials and Standards (VAMAS) TWA-2 Project A10 "X-ray reflectivity measurements for evaluation of thin films and multilayers"

National Institute of Standards and Technology, Gaithersburg, MD (2000 – 2004)
Physical Scientist (ZP-V), Quantum Metrology Group, Atomic Physics Division

Developed research programs in precision X-ray measurement technologies, analysis of defects in crystalline materials with high resolution X-ray diffraction, the development of high resolution X-ray methods, and the application of X-ray analytical techniques to semiconductor manufacturing

Specific accomplishments:

- *The Avogadro project:* Championed the return of NIST to an international collaboration to redefine the Avogadro constant (and eventually, the kilogram) via the Si crystal density, and performed high precision ($\Delta d/d \approx 10^{-8}$) lattice parameter measurements on ultra-pure silicon
- *Semiconductor diagnostics:* Developed a close interaction with SEMATECH and its member companies on X-ray metrology techniques for semiconductor manufacturing, with emphasis on X-ray reflectivity for high-*k* dielectrics (HfO_2) and back-end metallization
- *Wavelet approatch to X*-ray reflectometry analysis: Developed methods for incorporating wavelet analysis into the interpretation of specular X-ray reflectometry data
- *Protein crystals:* Established a protein crystal growth facility in the Physics Laboratory as a necessary precursor for a program of intelligent X-ray diagnostics for protein crystal growth

University of Wisconsin, Madison WI (1988 - 2000)
Professor (tenured), Department of Materials Science and Engineering

Promoted from Assistant to Associate Professor (tenured) (1993) and from Associate to Full Professor (tenured) (1998); joint appointment with Department of Nuclear Engineering and Engineering Physics

Specific accomplishments:

- *High resolution X-ray diffraction analysis of semiconductor materials:* Instituted a program in developing and utilizing high resolution X-ray diffraction methods for the analysis of defects in semiconductor materials, with emphasis on high resolution triple axis techniques
- *Structural characteristics of novel epitaxial systems:* Collaborated with university and industrial colleagues to provide structural analyses of semiconductor systems such as GaN grown on sapphire; $LiGaO_2$ and SiC; alloys of Si, Ge and GaAs; and GaAs grown at low substrate temperatures by MBE
- *Process-induced surface damage in GaAs:* Directed a program to analyze and rationalize the damage generated in semiconductor surfaces by chemical-mechanical polishing and reactive ion etching using X-ray diffraction performed under conditions to maximize surface sensitivity
- *Plasma source ion implantation:* Served as Principal Investigator for a multi-year SEMATECH program on plasma-source ion implantation (PSII) as a tool for shallow junction doping in silicon
- *X-ray photo-assisted materials growth:* Initiated a highly speculative initiative to use X-ray standing wavefields to achieve X-ray photo-assisted CVD materials growth
- *High resolution X-ray diffraction analysis of protein crystals:* Developed a program to study structural perfection and radiation damage in protein crystals with high resolution X-ray diffraction
- *Teaching and mentoring:* Taught an array of courses for students ranging from freshman non-engineers to Ph.D. candidates, and supervised seven graduate students to successful Ph.D. degrees

Texas Instruments, Inc., Dallas, TX (1982 - 1988)
Member of the Technical Staff, Materials Science Laboratory, Central Research Laboratories

Responsible for conducting multiple materials growth and characterization activities in support of corporate technical objectives; also responsible for all phases of laboratory technician management

Specific accomplishments:

- *X-ray diffraction characterization facility:* Established and successfully operated a new X-ray diffraction facility (three sealed tube and two rotating anode X-ray sources, with eight X-ray analysis systems) that provided company-wide analytical support for TI customers
- *Molecular beam epitaxy growth of materials systems for nanotechnology:* Generated materials for ultra-small electronics (long before the term “nanotechnology” became part of popular culture),

including the first three terminal device based on resonant tunneling and the first controllable three dimensional quantized structure ("quantum dot") in an epitaxially grown heterostructure

- *Co-integration of GaAs and silicon devices:* Demonstrated the integration of materials and device technologies from two separate classes of materials in a single circuit, and executed a parallel program to develop the GaAs/Si technology required for the co-integration process
- *GaAs-on-Si optoelectronics:* Collaborated with a university group to fabricate the world's first room temperature operating continuous wave (CW) lasers utilizing epitaxial GaAs-on-Si
- *Millimeter-wave devices:* Fabricated advanced microwave devices (quantum well MISFET and pseudomorphic HEMT structures) primarily for military applications

Northwestern University, Evanston, IL (1978 - 1982)
Research/Teaching Asst., Dept. of Materials Science and Engineering

Ph.D. research included synthesis of metal catalysts, and characterization by transmission electron microscopy, X-ray diffraction, , and *in situ* Mössbauer spectroscopy. Teaching activities included introductory materials science courses as full-time instructor.

Northern Petrochemical Co., Morris, IL (1976 - 1978)
Development Specialist, Polymer Characterization

Developed additive systems for polypropylene; evaluated structural and rheological properties of polyethylene and polypropylene using gel permeation chromatography and viscoelasticity methods

Massachusetts Institute of Technology, Cambridge, MA (1975 - 1976)
Research/Teaching Asst., Dept. of Materials Science and Engineering

M.S.. research included the characterization of polymeric systems using small-angle X-ray scattering methods. Teaching responsibilities included undergraduate laboratory instruction.

Professional Affiliations

1. American Crystallographic Association
2. American Society of Engineering Education
3. Materials Research Society
4. National Academy of Inventors

Scientific Publications and Contributions

Overview

- Total Refereed Publications: 162 (Google Scholar total citations; 5722; *h*-factor: 35; most cited publication (No. 124 below): 1460 citations)
- Total Unrefereed Articles and Publications: 29
- Books and Book Chapters: 7
- Patents and Reference Standards: 6
- Contributed and Invited Presentations: 130 (Invited: 63)

Refereed Publications

1. S.L. Wallen, R.J.Matyi, C.T. Rittenhouse and L.B. Wemple, "A Simple, Renewable, Zero Hazardous Waste Adsorption Demonstration: *Brassica Oleracea Capitata Rubra* (Red Cabbage) Anthocyanin Adsorption on Wool" *Journal of Chemical Education*, submitted
2. S. Srinivasan, M.B.J Charles, H.C. Royce, S.L.Wallen, R.J. Matyi and A.R. Tanna, "Thermochemical Energy Storage using Phosphatic Pebbles" *MRS Advances* https://doi.org/ 10.1557/s43580-021-00097-y (2021).
3. R.J. Matyi and R.I. MacCuspie, "Characterization of Nanoparticles for NanoEHS Studies", *IEEE Nanotechnology Magazine* (Invited Review), **14(5)**, 7 (2020).
4. A.J. Narasimham, A. Green, R.J. Matyi, P. Khare, T. Vo, A.C. Diebold and V.P. LaBella, "Pulsed-N_2 assisted growth of 5-20 nm thick β-W films" *AIP Advances*, **5**, 117107 (2015).
5. B.B. Alam, A.W. O'Toole, R.J. Matyi and S.A. Brenner, "Synthesis and Characterization of Ceria Supported Platinum via Facile Wet Impregnation from Cerium Based Precursors" *Journal of Advanced Chemical Engineering*, **5**, 1000123 (2015).
6. A.J. Narasimham, M. Medikonda, A. Matsubayashi, P. Khare, H. Chong, R.J. Matyi, A.C. Diebold, and V.P. LaBella, "Fabrication of 5-20 nm Thick β-W Films" *AIP Advances*, **4**, 117139 (2014).
7. C.M. Settens, A. Cordes, B.D. Bunday, A.F. Bello, V.K. Kamineni, A. Paul, J. Fronheiser and R.J. Matyi, "An Assessment of CD-SAXS Measurement Approaches for FinFET Fabrication Process Monitoring" *Journal of Micro/Nanolithography, MEMS, and MOEMS*, **13**, 041408 (2014).
8. T.A. Reese, S.B. Schujman and R.J. Matyi, "Structure Evolution In CIGS Deposition: An X-ray Diffraction Analysis With Rietveld Whole-Pattern Refinement" *Proc. 40th IEEE Photovoltaic Specialist Conference*, 1691 (2014).
9. R.B. Jacobs-Gedrim, M. Shanmugam, N. Jain, C.A. Durcan, M.T. Murphy, T.M. Murray, R.J. Matyi, R.L. Moore, and B. Yu "Extraordinary Photoresponse in Two-Dimensional In_2Se_3 Nanosheets" *ACS Nano*, **8**, 514 (2014).
10. C.M. Settens, B.D. Bunday, R.J. Kline, D.F. Sunday, C. Wang, W.L. Wu and R.J. Matyi, "Critical Dimension Small Angle X-ray Scattering Measurements of FinFET and 3D Memory Structures," *SPIE Proceedings* **8681** (Metrology, Inspection, and Process Control for Microlithography XXVII, 86810L (2013).
11. P.K. Shreeman, K.A. Dunn, S.W. Novak and R.J. Matyi, "Modified Statistical Dynamical Diffraction Theory: Analysis of Model SiGe Heterostructures" *Journal of Applied Crystal-lography,* **46**, 912 (2013).
12. J. Borland, S. Qin, P. Oesterlin, K. Huet, W. Johnson, L. Klein, G. Goodman, A. Wan, S. Novak, T. Murray, R. Matyi, A. Joshi and S. Prussin, High mobility Ge-Channel Formation by Localized/Selective Liquid Phase Epitaxy (LPE) Using Ge+B Plasma Ion Implantation and Laser Melt Annealing, *Proc. 13th International Workshop on Junction Technology*, 49 (2013).
13. N.J. Biderman, S.W. Novak, T. Laursen, R.J. Matyi, R. Sundaramoorthy, G. Dufresne, J. Wax, M. Gardner, D. Fobare, D. Metacarpa, P. Haldar and J.R. Lloyd, "Diffusion Activation Energy of Cadmium in Thin Film $CuInGaSe_2$" *Proc. 39th IEEE Photovoltaic Specialist Conference*, 1836 (2013)
14. J.O. Capulong, B.D. Briggs, S.M. Bishop, M.O. Hovish, R.J. Matyi and N.C. Cady, "Effect of Crystallinity on Endurance and Switching Behavior of HfO_x-Based Resistive Memory Devices" *Proc. 2012 IEEE International Integrated Reliability Workshop*, 22 (2012)
15. B.L. Thiel, A.J. Cepler, A.C. Diebold and R.J. Matyi, "Advances in CD-Metrology (CD-SAXS, Mueller Matrix based Scatterometry, and SEM)" *2011 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics (AIP Conference Proceedings)*, **1395**, 298 (2011).

16. E. Bersch, J.D. LaRose, I. Wells, S. Consiglio, R.D. Clark, G.J. Leusink, R.J. Matyi and A.C. Diebold, "Multi-technique Approach for the Evaluation of the Crystalline Phase of Utrathin High-*k* Gate Oxide Films" *2011 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics (AIP Conference Proceedings)*, **1395**, 154 (2011).
17. V. Tokranov, P. Nagaiah, M. Yakimov, R.J. Matyi and S. Oktyabrsky, "AlGaAsSb Superlattice Buffer Layer for *p*-Channel GaSb Quantum Well on GaAs Substrate" *Journal of Crystal Growth*, **323**, 35 (2011).
18. S.M. Bishop, H. Bakhru, S.W. Novak, B.D. Briggs, R.J. Matyi and N.C. Cady, "Ion Implantation Synthesized Copper Oxide-Based Resistive Memory Devices" *Applied Physics Letters*, **99**, 202102 (2011).
19. P.K. Shreeman and R.J. Matyi, "Application of Statistical Dynamical Diffraction Theory to Highly Defective Ion Implanted SiGe Heterostructures" *Physica Status Solidi A*, **208**, 2533 (2011).
20. N.A. Joy, C.M. Settens, R.J. Matyi and M.A. Carpenter, "Plasmonic Based Kinetic Analysis of Hydrogen Reactions Within Au-YSZ Nanocomposites", *Journal of Physical Chemistry C*, **115**, 6283 (2011).
21. B.D. Briggs, S.M. Bishop, J.O. Capulong, M.O. Hovish, R.J. Matyi and N.C. Cady, "Comparison of HfO_x-Based Resistive Memory Devices with Crystalline and Amorphous Active Layers" *Proc. 2011 International Semiconductor Device Research Symposium* (2011).
22. C. Higgins, C. Settens, P. Wolfe, K. Petrillo, R. Auger, R. Matyi and R. Brainard, "Coefficient of Thermal Expansion (CTE) in EUV Lithography: LER and Adhesion Improvement" *SPIE Proceedings* **7972** (Advances in Resist Materials and Processing Technology XXVIII), 797211 (2011).
23. W.T. Spratt, M. Huang, C. Jia, L. Wang, V.K. Kamineni, A.C. Diebold, R.J. Matyi and H. Xia, "Effects of Hydrogen Ion Implantation and Thermal Annealing on Structural and Optical Properties of Single-crystal Sapphire" *Materials Research Society Proceedings* ('Ion Beams – New Applications from Mesoscale to Nanoscale', eds. G. Marletta, A. Öztarhan, J. Baglin, and D. Ila), **1354**, II09-02 (2010).
24. C. Higgins, S. Kruger, V. Kamineni, R. Matyi, J. Georger and R. Brainard, "Understanding Ultra-Thin Film Resist and Underlayer Performance through Physical Characterization" *Journal of Photopolymer Science and Technology*, **23**, 699 (2010).
25. R.J. Matyi and R.E. Geer, "Implementation of a Curriculum Leading to a Baccalaureate Degree in Nanoscale Science" *Materials Research Society* Proceedings ('Materials Education', eds. D. Dunham, E. Marshall, J. Nucci and M.M. Patterson), **1233,** PP06-09 (2011).
26. P.K. Shreeman and R.J. Matyi, "Implementation and Application of Statistical Dynamical Diffraction Theory for Defective Semiconductor Heterostructures" *Journal of Applied Crystallography*, **43**, 550 (2010).
27. V.K. Kamineni, A. Grill, G.A. Antonelli, C.M. Settens, R.J. Matyi and A.C. Diebold, "Spec-troscopic Ellipsometry of Porous Low-κ Dielectric Thin Films" *2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics (AIP Conference Proceedings)*, **1173**, 163 (2009).
28. C.M. Settens, V.K. Kamineni, G.A. Antonelli, A. Grill, A.C. Diebold and R.J Matyi, "X-ray Scattering Methods for Porosity Metrology of Low-κ Thin Films" *2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics (AIP Conference Proceedings)*, **1173**, 168 (2009).
29. P.K. Shreeman and R.J Matyi, "Application of Statistical Dynamical X-ray Diffraction Theory to Defective Semiconductor Heterostructures" *2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics (AIP Conference Proceedings)*, **1173**, 385 (2009).

30. R.L. Brainard, C.D. Higgins, E.A. Hassanein, R.J. Matyi and A. Wüest, "Film Quantum Yields of Ultrahigh PAG EUV Photoresists" *Journal of Photopolymer Science and Technology*, **21**, 457 (2008).

31. R.J. Matyi, L.E. Depero, E. Bontempi, P. Colombi, A. Gibaud, M. Jergel, M. Krumrey, T.A. Lafford, A. Lamperti, M. Meduna, A. Van der Lee and C. Wiemer, "The International VAMAS Project on X-Ray Reflectivity Measurements of Thin Films and Multilayers – Preliminary Results From The Second Round-Robin" *Thin Solid Films*, **516**, 7962 (2008).

32. R.L. Brainard, E.A. Hassanein, J. Li, P. Pathak, B.L. Thiel, F. Cerrina, R.L. Moore, M. Rodriguez, B. Yakshinskiy, E. Loginova, T. Madey, R.J. Matyi, M. Malloy, A. Rudack, P. Naulleau, A. Wüest and K. Dean, "Photons, Electrons, and Acid Yields in EUV Photoresists: A Progress Report" *SPIE Proceedings* ('Advances in Resist Materials and Processing Technology XXV', ed. C.L. Henderson), **6923**, 692325-1-14 (2008)

33. E.A. Hassanein, C.D. Higgins, P. Naulleau, R.J. Matyi, G. Gallatin, C.N. Anderson, D. Niakoula, G.P. Denbeaux, A. Antohe, J. Thackeray, K. Spear, C. Szmanda, M. Malloy, A. Khurshid, C. Montgomery, E.C. Piscani, A. Rudack, J. Byers, A. Ma, K. Dean and R.L. Brainard, "Film Quantum Yields of EUV & Ultra-High PAG Photoresists", *SPIE Proceedings* ('Emerging Lithographic Technologies XII', ed. F.M. Schellenberg), **6921**, 69211I-1-13 (2008).

34. G.M. Gallatin, P. Naulleau, D. Niakoula, R. Brainard, E.A. Hassanein, R.J. Matyi, J. Thackeray, K. Spear and K. Dean, "Resolution, LER, and Sensitivity Limitations of Photoresists" *SPIE Proceedings* ('Emerging Lithographic Technologies XII', ed. F.M. Schellenberg), **6921**, 69211E-1-11 (2008).

35. A.J. Stollenwerk, E.J. Spadafora, J.J. Garramone, R.J. Matyi, R.L. Moore and V.L. LaBella, "The Effect of Interface Band Structure on the Measurement of Hot Attenuation Lengths Using Ballistic Electron Emission Microscopy", *Physical Review B*, **77**, 033416 (2008).

36. D. Agnihotri, V.E. Asadchikov, E. Bontempi, C-H. Chang, P. Colombi, L.E. Depero, M. Farnworth, T. Fujimoto, A. Gibaud, M. Jergel, D.K. Bowen, M. Krumrey, A. Lamperti, T. Lafford, R.J. Matyi, T. Ma, M. Meduna, S. Milita, K. Sakurai, L. Shabel'nikov, A. Ulyanenkov, A. van der Lee and C. Wiemer, "Accuracy in X-ray Reflectometry: Results From the First Reflectivity Round Robin" *Journal of Applied Crystallography*, **41**, 143 (2008) .

37. R.J. Matyi, M. Jamil and F. Shahedipour-Sandvik, "High Resolution X-ray Diffraction Analyses of Ion-Implanted GaN/AlN/Si Heterostructures" *Physica Status Solidi A*, **204,** 2598 (2007).

38. Y. Zhu, C. Miller, M. Bresin, R.J. Matyi, K.A. Dunn and A.E. Kaloyeros, "Copper Electroplating on Zero-Thickness ALD Platinum for Nanoscale Computer Chip Interconnects", *Materials Research Society Proceedings* ('Materials, Technology and Reliability of Low-*k* Dielectrics and Copper Interconnects', eds. T.Y. Tsui, Y.C. Joo, L. Michaelson, M. Lane and A. A. Volinsky), **914**, F05-08 (2006).

39. T. Yu, H. Efstathiadis, R.J. Matyi, P. Haldar, S. Ghamaty and N. Elsner, "Large Area Depositions of Si/SiC Quantum Well Thermoelectric Generator", *Materials Research Society Proceedings* ('Materials and Technologies for Direct Thermal-to-Electric Energy Conversion', eds. J. Yang, T. P. Hogan, R. Funahashi and G.S. Nolas)*,* **886**, F04-08 (2006).

40. R.J. Matyi, M.S. Hatzistergos and E. Lifshin, "X-ray Reflectometry Analyses of Chromium Thin Films" *Thin Solid Films*, **515**, 1286 (2006).

41. K. Fujii, A. Waseda, N. Kuramoto, S. Mizushima, P. Becker, H. Bettin, A. Nicolaus, U. Kuetgens, S. Valkiers, P. Taylor, P. De Bievre, G. Mana, E. Massa, R.J. Matyi, E. Kessler and M. Hanke, "Present State of the Avogadro Constant Determination from Silicon Crystals with Natural Isotopic Compositions", *IEEE Transactions on Instrumentation and Measurement*, **54,** 854 (2005)

42. R.J. Matyi, "High Resolution X-ray Scattering Methods for ULSI Materials Characterization" *Characterization and Metrology for USLI Technology 2003 (AIP Conference Proceedings)*, **683**, 634 (2003).

43. A. Roshko, K. Bertness, J. Armstrong, R. Marinenko, M. Salit, L. Robins, A. Paul and R. Matyi, "X-ray, Photoluminescence and Composition Standards of Compound Semiconductors" *Physica Status Solidi C*, **3**, 992 (2003).

44. R.J. Matyi, "High Resolution X-ray Reflectometry: Theory, Practice, Accuracy and Precision" *SPIE Proceedings* ('Analytical and Diagnostic Techniques for Semiconductor Materials, Devices and Processes'), **5133**, 440 (2003)

45. R.J. Matyi and H.M. Volz, "Analysis of Radiation Damage in Lysozyme Crystals with High Resolution Triple Axis X-ray Diffraction" *Materials Research Society Proceedings* (`Advanced Biomaterials – Characterization, Tissue Engineering and Complexity', ed. S.C. Moss), **711**, 19 (2002).

46. T.F. Kelly, T.T. Gribb, R.L.Martens, D.J. Larson, N. Tabat, R.J. Matyi and T.J. Shaffner, "Local Electrode Atom Probes: Prospects for 3D Atomic Scale Metrology Applications in the Semiconductor and Data Storage Industries" *Characterization and Metrology for USLI Technology 2000 (AIP Conference Proceedings)*, **550**, 620 (2001).

47. H.M. Volz and R.J. Matyi, "A High Resolution Triple Axis X-ray Diffraction Analysis of Radiation Damage in Lysozyme Crystals" *Journal of Crystal Growth*, **232**, 502 (2001).

48. I.R. Prudnikov, R.J. Matyi and R.D. Deslattes, "Wavelet Transform Approach to the Analysis of Specular X-ray Reflectivity Curves" *Journal of Applied Physics*, **90**, 3338 (2001).

49. R.J. Matyi and H.M. Volz, "Triple Axis X-ray Diffraction Analysis of Hen Egg White Lysozyme Crystals" *Journal of Physics D*, **34**, A64 (2001).

50. K.A. Dunn, S.E. Babcock, D.S. Stone, R.J. Matyi, L. Zhang and T.F. Kuech, "Dislocation Arrangements in Thick LEO GaN on Sapphire", *MRS Internet Journal of Nitride Semiconductor Research*, **5S1**, U88 (2000).

51. H.M. Volz and R.J. Matyi, "High Resolution Triple Axis X-ray Diffraction Analyses of Lysozyme Crystals" *Acta Crystallographica D*, **56**, 881 (2000).

52. P.D. Moran, D.M. Hansen, R.J. Matyi, L.J. Mawst and T.F. Kuech, "An Experimental Test of Elastic Compliance During InGaAs Growth on GaAs Glass Bonded Compliant Substrates" *Applied Physics Letters*, **76**, 2541 (2000).

53. R.J. Matyi, P.D. Moran, W.W.D. Hagquist and H.M. Volz, "Alignment System for Crossed Parabolic X-ray Mirrors" *Review of Scientific Instruments,* **71**, 2292 (2000).

54. C.H. Su, M. Dudley, R.J. Matyi, S. Feth and S.L. Lehoczky, "Characterizations of ZnSe Single Crystals Grown by Physical Vapor Transport" *Journal of Crystal Growth*, **208**, 237 (2000).

55. P.D. Moran and R.J. Matyi, "The Effect of the Diffractometer's Resolution Function in High Resolution Triple Crystal X-ray Diffraction" *Advances in X-ray Analysis*, **41**, 179 (1999).

56. H. Chung, Y. Guo, M. Dudley, H.M. Volz, C. Salles and R.J. Matyi, "Characterization of Microgravity and Ground-Based Grown Crystals Using Synchrotron White Beam X-ray Topography and High Resolution Triple Axis X-ray Diffraction" *Advances in X-ray Analysis*, **41**, 148 (1999).

57. H.M. Volz, R.J. Matyi and J.M. Redwing, "High Resolution X-ray Diffraction Analysis of Gallium Nitride/Silicon Carbide Heterostructures" *Advances in X-ray Analysis*, **41**, 139 (1999).

58. C.H. Su, S. Feth, M.P. Volz, R.J. Matyi, M.A. George, K. Chattopadhyay, A. Burger and S.L. Lehoczky, "Vapor Growth and Characterization of Cr-doped ZnSe Crystals" *Journal of Crystal Growth*, **207**, 35 (1999).

59. P.D. Moran, D.M. Hansen, R.J. Matyi, J.G. Cederberg, L.J. Mawst and T.F. Kuech, "InGaAs Heteroepitaxy on GaAs Compliant Substrates: X-ray Diffraction Evidence of Enhanced Relaxation and Improved Structural Quality" *Applied Physics Letters*, **75**, 1559 (1999).

60. P.D. Moran, D.M. Hansen, R.J. Matyi, J.M. Redwing and T.F. Kuech, "Realization and Characterization of Ultra-thin GaAs-on-Insulator Structures" *Journal of the Electrochemical Society*, **146**, 3506 (1999).

61. H.M. Volz and R.J. Matyi, "High Resolution X-ray Diffraction Analyses of Protein Crystals" *Philosophical Transactions of the Royal Society (London) A*, **357**, 2789 (1999).

62. R.J. Matyi, W.A. Doolittle and A.S. Brown, "High Resolution X-ray Diffraction Analysis of GaN/$LiGaO_2$" *Journal of Physics D*, **32**, 61 (1999).

63. M. Chun, B. Kim, J.R. Conrad, R.J. Matyi, S.M. Malik, P. Fetherston and S. Han, "High Dose Rate Effects in Silicon by Plasma Source Ion Implantation" *Journal of Vacuum Science and Technology*, **B17**, 863 (1999).

64. J. Li, A. Mirabedini, L.J. Mawst, D.E. Savage, R.J. Matyi and T.F. Kuech, "Effect of Interface Roughness on Perfomance of AlGaAs/InGaAs/GaAs Resonant Tunneling Diodes" *Journal of Crystal Growth*, **195**, 617 (1998).

65. D.M. Hansen, P.D. Moran, K.A. Dunn, S.E.Babcock, R.J. Matyi and T.F. Kuech, "Development of Glass-Bonded Compliant Substrate" *Journal of Crystal Growth*, **195**, 144 (1998).

66. D.J. Larson, M.K. Miller, R.M. Ulfig, R.J. Matyi, P.P. Camus and T.F. Kelly, "Field Ion Specimen Preparation From Near-Surface Regions" *Ultramicroscopy*, **73**, 273 (1998)

67. S.B. Felch, B.S. Lee, S.L. Daryanani, D.F. Downey and R.J. Matyi, "Characterization of Ultra-Shallow p^+-*n* Junctions Formed by Plasma Doping with BF_3 and N_2 Plasmas" *Materials Chemistry and Physics*, **54**, 37 (1998).

68. T.W. Staley and R.J. Matyi, "Diffractometer Noise Characteristics: Experimental Determination and Application to Statistical Rocking Curve Analysis" *Journal of Applied Crystallography*, **31**, 185 (1998).

69. R.J. Matyi, S.B. Felch, B.S. Lee, M.R. Strathman, J.A. Keenan, Y. Guo and L. Wang, "Process Effects in Shallow Junction Formation by Plasma Doping" *Journal of Vacuum Science and Technology*, **B16**, 435 (1998).

70. R.J. Matyi, S.B. Felch, B.S. Lee, M.R. Strathman, J.A. Keenan., Y. Guo and L. Wang, "Process Effects in Shallow Junction Formation by Plasma Doping" *Proc. 4th Int'l Workshop on the Measurement, Characterization and Modeling of Ultra-Shallow Doping Profiles in Semiconductors*, 47.1 (1997).

71. S.A. Safvi, N.R. Perkins, M.N. Horton,. R.J. Matyi and T.F. Kuech "Effect of Reactor Geometry and Growth Parameters on the Uniformity and Material Properties of GaN/ Sapphire Grown by Hydride Vapor-Phase Epitaxy" *Journal of Crystal Growth,* **182,** 233 (1997).

72. R.J. Matyi, D.L. Chapek, D.P. Brunco, S.B. Felch and B.S. Lee, "Boron Doping of Silicon by Plasma Source Ion Implantation" *Surface and Coatings Technology*, **93**, 247 (1997).

73. T.W. Staley and R.J. Matyi, "A Statistical Method for the Fitting of Double Crystal X-ray Rocking Curves" *Journal of Applied Crystallography*, **30**, 368 (1997).

74. M.R. Deshpande, J.W. Sleight, M.A. Reed, R.G. Wheeler and R.J. Matyi, "Zeeman Splitting of Single Semiconductor Impurities in Resonant Tunneling Heterostructures" *Superlattices and Microstructures*, **20**, 513 (1996).

75. N.R. Perkins, M.N. Horton, D. Zhi, R.J. Matyi, Z.Z. Bandic, T.C. McGill and T.F. Kuech, "Nucleation and Growth of Gallium Nitride Films on Si and Sapphire Substrates using Buffer Layers", *Materials Research Society Proceedings* ('III-Nitride, SiC and Diamond Materials for Electronic Devices', eds. D.K. Gaskill, C.D. Brandt, and R.J. Nemanich) **423**, 287 (1996).

76. R.J. Matyi, D. Zhi, N.R. Perkins, M.N. Horton and T.F. Kuech, "High Resolution X-ray Diffraction

Analysis of GaN Grown by Halide Vapor Phase Epitaxy", *Materials Research Society Proceedings* ('III-Nitride, SiC and Diamond Materials for Electronic Devices', eds. D.K. Gaskill, C.D. Brandt, and R.J. Nemanich), **423**, 239 (1996).

77. J.W. Sleight, E.S. Hornbeck, M.R. Deshpande, M.A. Reed, R.C. Bowen, W.R. Frensley, J.N. Randall and R.J. Matyi, "Electron-Spectroscopic Study of Vertical $In_{1-x}Ga_xAs$ Quantum Dots" *Physical Review B*, **53**, 15,727 (1996).

78. R.J. Matyi, D.P. Brunco, S.B. Felch, E. Ishida, L. Larson, L. Wang and S. Wang, "Materials Properties of B-Doped Si by Low Energy Plasma Source Ion Implantation" *Proceedings 11th Int'l Conference on Ion Implantation Technology*, 749 (1996).

79. M.R. Deshpande, J.W. Sleight, M.A. Reed, R.G. Wheeler and R.J. Matyi, "Spin Splitting of Single 0-D Impurity States in Semiconductor Heterostructure Quantum Wells" *Physical Review Letters*, **76**, 1328 (1996).

80. R.J. Matyi, M.R. Melloch, K. Zhang and D.L. Miller, "Structural Characterization of GaAs Grown At Low Temperatures By Molecular Beam Epitaxy" *Journal of Physics D*, **28**,139 (1995).

81. J.K. Wade, P.D. Moran, H.J. Gillespie, G.E. Crook and R.J. Matyi, "Stability of GaAs/Si Superlattices during MBE Growth and Post-Growth Processing" *Materials Research Society Proceedings* (`Growth, Processing and Characterization of Semiconductor Heterostructures', eds. G. Gumbs, S. Luryi, B. Weiss and G.W. Wicks), **326**, 133 (1994).

82. V.S. Wang, R.J. Matyi and K.J. Nordheden, "Characterization of Reactive Ion Etch Damage in GaAs by Triple Crystal X-ray Diffraction" *Materials Research Society Proceedings* ('Diagnostic Techniques for Semiconductor Materials Processing', eds. O.J. Glembocki, S.W. Pang, F.H. Pollak, G.M. Crean and G. Larrabee), **324**, 445 (1994).

83. R.J. Matyi, D.L. Chapek, J.R. Conrad and S.B. Felch, "Structural Analysis of Silicon Doped by Plasma Source Ion Implantation" *Materials Research Society Proceedings* ('Materials Synthesis and Processing Using Ion Beams', eds. R.J. Culbertson, O.W. Holland, K.S. Jones and K. Maex) **316,** 1017 (1994).

84. L.D. Macks, S.A. Brown, R.P. Starrett, R.G. Clark, M.R. Deshpande, M.A. Reed, C.J.L. Fernando, W.R. Frensley and R.J. Matyi, "High Magnetic Field Tunneling Transport in a Double Quantum Well-Triple Barrier Resonant Tunneling Diode" *Physica B* **201**, 374 (1994).

85. V.S. Wang, R.J. Matyi and K.J. Nordheden, "Triple Crystal X-ray Diffraction Analysis of Reactive Ion Etched GaAs" *Journal of Applied Physics*, **75**, 3835 (1994).

86. D.L. Chapek, J.R. Conrad, R.J. Matyi and S.B. Felch, "Structural Characterization of Plasma-Doped Silicon by High Resolution X-ray Diffraction" *Journal of Vacuum Science and Technology*, **B12**, 951 (1994).

87. S.B. Felch, T. Sheng, E. Ganin, K.K. Chan, D.L. Chapek, R.J. Matyi and J.R. Conrad, "Studies of Ultra-Shallow p^+-n Junction Formation Using Plasma Doping" *X International Conf. on Ion Implantation Technology Extended Abstracts* (Caania, Italy), P-6.1 (1994).

88. R.J. Matyi, M.R. Melloch and J.M. Woodall, "Structural Analysis of As-Deposited and Annealed Low-Temperature Gallium Arsenide" *Journal of Crystal Growth*, **129**,719 (1993).

89. P.D. Moran and R.J. Matyi, "On the X-ray Reflectivity of Absorbing Crystals" *Acta Crystallographica A*, **49**, 330 (1993).

90. H.J. Gillespie, J.K. Wade, G.E. Crook and R.J. Matyi, "High Resolution X-ray Diffraction Analysis of Si/GaAs Superlattices" *Journal of Applied Physics*, **73**, 95 (1993).

91. M.R. Deshpande, N.H. Dekker, J.W. Sleight, J.L. Huber, E.S. Hornbeck, M.A. Reed, R.J. Matyi, Y.C. Kao, C.J.L. Fernando and W.R. Frensley, "Observation of Novel Conductance Structure in

GaAs/$Ga_xAl_{1-x}As$ Resonant Tunneling Heterostructures" *Proc. IEEE Cornell Conf. on Advanced Concepts in High Speed Semiconductor Devices and Circuits*, 177 (1993).

92. T.W. Staley and R.J. Matyi, "A New Parametric Method for the Analysis of Ordering Configurations in Binary Solid Alloys" *Materials Research Society Proceedings* (`Computational Methods in Materials Science', eds. J.E. Mark, M.E. Glicksman and S.P. Marsh), **278**, 377 (1992).

93. H.J. Gillespie, J.K. Wade, G.E. Crook and R.J. Matyi, "MBE Growth and Structural Characterization of Si/GaAs Superlattices" *Materials Research Society Proceedings* (`Mechanisms of Heteroepitaxial Growth', eds. M.F. Chissolm, B.J. Garrison, R. Hull and L.J. Schowalter), **263**, 65 (1992).

94. V.S. Wang and R.J. Matyi, "Surface Characterization of Chemical-Mechanical Polished GaAs by Inclined Bragg Plane Triple Crystal X-ray Diffraction" *Materials Research Society Proceedings* (`Chemical Surface Preparation, Passivation and Cleaning for Semiconductor Growth and Processing', eds. R.J. Nemanich, C.R. Helm, M. Hirose and G.W. Rubloff), **259**, 335 (1992).

95. V.S. Wang and R.J. Matyi, "Triple Crystal X-ray Diffraction Analysis of Chemical-Mechanical Polished Gallium Arsenide" *Journal of Applied Physics*, **72**, 5158 (1992).

96. V.S. Wang and R.J. Matyi, "X-ray Diffraction Observation of Surface Damage in Chemical Mechanical Polished GaAs" *Journal of Electronic Materials*, **21**, 23 (1992).

97. P.D. Moran and R.J. Matyi, "The Effect of Absorption on the Integrated Reflectivity of Defective Single Crystals" *Journal of Applied Crystallography*, **25**, 358 (1992).

98. R.J. Matyi, "Conversion of a Commercial Double Crystal Diffractometer to a Triple Crystal Diffractometer" *Review of Scientific Instruments*, **63**, 5591 (1992).

99. R.J. Matyi, M.R. Melloch and J.M. Woodall, "High Resolution X-ray Diffraction Study of Annealed Low-Temperature GaAs" *Applied Physics Letters*, **60**, 2642 (1992).

100. H.J. Gillespie, G.E. Crook and R.J. Matyi, "Growth of Si/GaAs Superlattices by Molecular Beam Epitaxy" *Applied Physics Letters*, **60**, 721 (1992).

101. H. E. Inglefield, R.J. Matyi and R. Korenstein, "Epitaxial Layer Misorientation in CdTe on GaAs" *Materials Research Society Proceedings* (`Evolution of Thin Film and Surface Microstructure', eds. C.V. Thompson, J.Y. Tsao and D.J. Srolovitz), **202**, 543 (1991).

102. P.D. Moran and R.J. Matyi, "Effect of the Extinction Distance in X-ray Rocking Curve Analyses of II-VI Compounds" *Materials Research Society Proceedings* (`Defects in Materials', eds. P.D. Bristowe, J.E. Epperson, J.E. Griffith and Z. Liliental-Weber), **209**, 463 (1991).

103. D.C. Hall, N. Holonyak, D.G. Deppe, M.J. Ries, R.J. Matyi, H. Shichijo and J.E. Eppler "Low Temperature Operating Life of Continuous 300K $Al_xGa_{1-x}As$-GaAs Quantum Well Heterostructure Lasers Grown on Si" *Journal of Applied Physics*, **69**, 6844 (1991).

104. H. Shichijo, Y.C. Kao, T.S. Kim, A.H. Taddiken and R.J. Matyi, "Material Problems of GaAs-on-Si and Applications to LSI" *Inst. Phys. Conf. Series (Proc. 16th Int'l Symp. on GaAs and Related Compounds)*, **106**, 519 (1990).

105. J.N. Randall, M.A. Reed, J.H. Luscombe, G.F. Frazier, W.R. Frensley, A.C. Seabaugh, Y.C. Kao, T.M. Moore and R.J. Matyi, "Advances in the Processing of Quantum Coupled Devices" *SPIE Proceedings* (`Nanostructures and Microstructure Correlation with Physical Properties of Semiconductors'), **1284**, 66 (1990).

106. H. Shichijo, R.J. Matyi, A.H. Taddiken and Y.C. Kao, "Monolithic Process for Co-Integration of GaAs MESFET and Silicon CMOS Devices and Circuits" *IEEE Transactions on Electron Devices*, **37**, 548 (1990).

107. W.M. Duncan, R.J. Matyi, H. Shichijo, Y.C. Kao and H.Y. Liu, "Micro-Raman Characterization of

Structural Defects in Patterned GaAs-on-Si" *Applied Physics Letters*, **57**, 1631 (1990).

108. E.G. Bauer, B.W. Dodson, D.J. Ehrlich, L.C. Feldman, C.P. Flynn, M.W. Geis, J.P. Harbison, R.J. Matyi, P.M. Petroff, J.M. Phillips, P.S. Peercy, G.B. Stringfellow and A. Zangwill, "Fundamental Issues in Heteroepitaxy – A Department of Energy, Council on Materials Science Panel Report" *Journal of Materials Research*, **5**, 852 (1990).

109. B. Kim, R.J. Matyi, M. Wurtele, K. Bradshaw and H.Q. Tserng, "Boost Performance of Millimeter-Wave Quantum Well Devices" *Microwaves & RF*, **28**, 75 (1989).

110. R.J. Matyi and H. Shichijo, "Selected Area Heteroepitaxial Growth of GaAs on Silicon for Advanced Device Structures" *Thin Solid Films*, **181**, 213 (1989).

111. H.L. Tsai and R.J. Matyi, "Generation of Misfit Dislocations in GaAs Grown on Si" *Applied Physics Letters*, **55**, 265 (1989).

112. A.C. Seabaugh , W.R. Frensley, J.N. Randall, M.A. Reed, D.L. Farrington and R.J. Matyi, "Pseudomorphic Bipolar Quantum Resonant Tunneling Transistor" *IEEE Transactions on Electron Devices*, **36**, 2328 (1989).

113. M.A. Reed, W.R. Frensley, R.T. Bate, R.J. Matyi, J.N. Randall, A.C. Seabaugh and C.H. Yang, "Realization of a Three Terminal Resonant Tunneling Device: The Bipolar Quantum Resonant Tunneling Transistor (BiQuaRTT)" *Applied Physics Letters*, **54**, 1034 (1989).

114. M.A. Reed, W.M. Duncan, W.R. Frensley, R.J. Matyi, A.C. Seabaugh and H.L. Tsai, "Quantitative Resonant Tunneling Spectroscopy: Current-Voltage Characteristics of Precisely Characterized RTDs" *Applied Physics Letters*, **54**, 1256 (1989).

115. W.E. Plano, D.W. Nam, K.C. Hsieh, L.J. Guido, A.R. Sugg, N. Holonyak, R.J. Matyi and H. Shichijo, "Dislocation-Accelerated Impurity-Induced Layer Disordering of $Al_xGa_{1-x}As$-GaAs Quantum Well Heterostructures Grown on GaAs-on-Si" *Applied Physics Letters*, **55**, 1993 (1989).

116. B. Kim, R.J. Matyi, M. Wurtele, K. Bradshaw, A. Khatibzadeh and H.Q. Tserng, "Millimeter-Wave Power Operation of AlGaAs/InGaAs/GaAs Quantum Well MISFET" *IEEE Transactions on Electron Devices*, **36**, 2236 (1989).

117. A.C. Seabaugh, W.R. Frensley, R.J. Matyi and G.E. Cabaniss, "Electrochemical C-V Profiling of an AlGaAs/GaAs MODFET Structure" *IEEE Transactions on Electron Devices*, **36**, 309 (1989).

118. H. Shichijo, R.J. Matyi and A.H. Taddiken, "Co-Integration of GaAs MESFET and Si CMOS Circuits Using GaAs-on-Si Epitaxial Growth" *Inst. Phys. Conf. Series (Proc. 15th Int'l Symp. on GaAs and Related Compounds)*, **96**, 352 (1989).

119. R.J. Matyi, H.F. Schaake, D.G. Deppe and N. Holonyak, "Epitaxial Layer Misorientation in Heteroepitaxial GaAs on Si" *Electrochemical Society Proceedings* (Symp. on Heteroepitaxial Approaches in Semiconductors: Lattice Mismatch and its Consequences), **89-5**, 195 (1989).

120. C.H. Yang and R.J. Matyi, "Dependence of Resonant Tunneling Current Density on Impurity Doping in $GaAs/Al_xGa_{1-x}As$ Double Barrier Resonant Tunneling Structures" *Inst. Phys. Conf. Series (Proc. 15th Int'l Symp. on GaAs and Related Compounds)*, **96**, 299 (1989).

121. M.A. Reed, W.M. Duncan, W.R. Frensley, R.J. Matyi, A.C. Seabaugh and H.L. Tsai, "Quantitative Resonant Tunneling Spectroscopy: Current-Voltage Characteristics of Precisely Characterized RTDs" *Institute of Physics Conference Series (Proceedings 15th International Symposium on GaAs and Related Compounds)*, **96**, 587 (1989).

122. R.J. Matyi, H. Shichijo and H.L. Tsai, "Patterned Growth of Gallium Arsenide on Silicon" *Journal of Vacuum Science and Technology*, **B6**, 699 (1988).

123. H. Shichijo, R.J. Matyi and A.H. Taddiken, "Co-Integration of GaAs MESFET and Si CMOS Circuits"

IEEE Electron Device Letters, **9**, 444 (1988).

124. M.A. Reed, J.N. Randall, R.J. Aggarwal, R.J. Matyi, T.M. Moore and A.E. Wetsel, "Observation of Discrete Electronic States in a Zero-Dimensional Semiconductor Nanostructure" *Physical Review Letters*, **60**, 535 (1988).

125. R.J. Matyi, W.M. Duncan, H. Shichijo and H.L. Tsai, "Effect of Post-Growth Annealing on Patterned GaAs on Silicon" *Applied Physics Letters*, **53**, 2611 (1988).

126. J.N. Randall, M.A. Reed, T.M. Moore, R.J. Matyi and J.W. Lee., "Microstructure Fabrication and Transport Through Quantum Dots" *Journal of Vacuum Science and Technology*, **B6**, 302 (1988).

127. J.N. Randall, M.A. Reed, R.J. Matyi and T.M. Moore, "Nanostructure Fabrication of Zero Dimensional Quantum Dot Diodes" *Journal of Vacuum Science and Technology*, **B6**, 1861 (1988).

128. D.C. Hall, D.G. Deppe, N. Holonyak, R.J. Matyi, H. Shichijo and J.E. Eppler "Thermal Behavior and Stability of Room Temperature Continuous $Al_xGa_{1-x}As$-GaAs Quantum Well Heterostructure Lasers Grown on Si" *Journal of Applied Physics*, **64**, 2854 (1988).

129. D.G. Deppe, D.C. Hall, N. Holonyak, R.J. Matyi, H. Shichijo and J.E. Eppler "Effects of Microcracking on Operation of $Al_xGa_{1-x}As$-GaAs Quantum Well Lasers Grown on Si" *Applied Physics Letters*, **53**, 874 (1988).

130. D.G. Deppe, N. Holonyak, K.C. Hsieh, D.W. Nam, W.E. Plano, R.J. Matyi and H. Shichijo, "Dislocation Reduction by Impurity Diffusion in Epitaxial GaAs Grown on Si" *Applied Physics Letters*, **52**, 1812 (1988).

131. S. Sakai, R.J. Matyi and H. Shichijo, "Growth of GaAs on GaAs-Coated Si by Liquid Phase Epitaxy" *Journal of Applied Physics*, **63**, 1075 (1988).

132. Y.S. Kim, R.V. Ramaswamy, S. Sakai, R.J. Matyi and H. Shichijo, "GaAs/AlGaAs Optical Waveguides of Silicon Substrates Grown by Molecular Beam Epitaxy" *Applied Physics Letters*, **53**, 1586 (1988).

133. P. Saunier, R.J. Matyi and K. Bradshaw, "A Double Heterojunction Doped Channel Pseudomorphic Power HEMT with a Power Density of 0.85 W/mm at 55 Ghz" *IEEE Electron Device Letters*, **9**, 397 (1988).

134. B. Kim, R.J. Matyi, M. Wurtele and H.Q. Tserng, "AlGaAs/InGaAs/GaAs Quantum Well Power MISFET at Millimeter Wave Frequencies" *IEEE Electron Device Letters*, **9**, 610 (1988).

135. R.J. Matyi, J.W. Lee. and H.F. Schaake, "Substrate Orientation and Processing Effects on GaAs/Si Misorientation in GaAs-on-Si Grown by MBE" *Journal of Electronic Materials*, **17**, 87 (1988).

136. H. Shichijo, R.J. Matyi and A.H. Taddiken, "Monolithic Process for Co-Integration of GaAs and Silicon Circuits" *1988 IEDM Technical Digest*, 778 (1988).

137. H. Shichijo, A.H. Taddiken and R.J. Matyi, "GaAs MESFET and Si CMOS Co-Integration and Circuit Techniques" *1988 GaAs IC Symposium Technical Digest*, 239 (1988).

138. A.C. Seabaugh , M.A. Reed, W.R. Frensley , J.N. Randall and R.J. Matyi, "Realization of Pseudomorphic and Superlattice Resonant Tunneling Transistors" *1988 IEDM Technical Digest*, 900 (1988).

139. R.J. Matyi, H. Shichijo, T.S. Kim and H.L. Tsai, "Properties of Patterned Gallium Arsenide on Silicon" *Materials Research Society Proceedings* (`Heteroepitaxy on Silicon: Fundamentals, Structures and Devices', eds. H.K. Choi, R. Hull, H. Ishiwara and R.J. Nemanich), **116**, 105 (1988).

140. B. Kim, R.J. Matyi, M. Wurtele, K. Bradshaw and H.Q. Tserng, "Millimeter Wave AlGaAs/InGaAs/GaAs Quantum Well Power MISFET" *1988 IEDM Technical Digest*, 168 (1988).

141. S. Sakai, S.S. Chang, R.J. Matyi and H. Shichijo, "Growth and Characterization of LPE GaAs on

GaAs-Coated Si Prepared by MBE" *Materials Research Society Proceedings* (`Heteroepitaxy on Silicon: Fundamentals, Structures and Devices', eds. H.K. Choi, R. Hull, H. Ishiwara and R.J. Nemanich), **116**, 155 (1988).

142. S. Sakai, S.S. Chang, R.J. Matyi and H. Shichijo, "Selective LPE Growth Kinetics of GaAs on MBE-Grown GaAs on Si" *SPIE Proceedings* (`Growth of Compound Semiconductor Structures'), **944**, 6 (1988).

143. J.N. Randall, M.A. Reed, T.M. Moore, R.J. Matyi, R.J. Aggarwal and A.E. Wetsel, "Nanofabrication of Quantum Coupled Devices" *SPIE Proceedings* (`Advanced Processing of Semiconductor Devices II'), **945**, 137 (1988).

144. R.J. Matyi, H. Shichijo, T.M. Moore and H.L. Tsai, "Microstructural Characterization of Patterned Gallium Arsenide on ⟨001⟩ Silicon Substrates" *Applied Physics Letters*, **51**, 18 (1987).

145. D.G. Deppe, D.W. Nam, N. Holonyak, K.C. Hsieh, R.J. Matyi, H. Shichijo, J.E. Eppler and H.F. Chung, "Stability of 300K Continuously Operating $Al_xGa_{1-x}As$-GaAs Quantum Well Lasers Grown on Si" *Applied Physics Letters*, **51**, 1271 (1987).

146. D.G. Deppe, N. Holonyak, D.W. Nam, K.C. Hsieh, R.J. Matyi, H. Shichijo, J.E. Eppler and H.F. Chung, "Room Temperature Operation of *p-n* $Al_xGa_{1-x}As$-GaAs Quantum Well Heterostructure Lasers Grown on Si" *Applied Physics Letters*, **51**, 637 (1987).

147. R.J. Matyi and M.A. Reed, "Quantization of the Hall Effect in a 3-Dimensional Quasi-periodic System" *Superlattices and Microstructures*, **3**, 535 (1987).

148. S. Sakai, R.J. Matyi and H. Shichijo, "Selective Liquid Phase Epitaxy and Defect Reduction in GaAs Grown on GaAs-Coated Silicon by Molecular Beam Epitaxy" *Applied Physics Letters*, **51**, 1913 (1987).

149. J.W. Lee., H. Shichijo, H.L. Tsai and R.J. Matyi, "Defect Reduction by Thermal Annealing of GaAs Layers Grown by Molecular Beam Epitaxy on Si Substrates" *Applied Physics Letters*, **50**, 31, (1987).

150. R.J. Matyi, L.H. Schwartz and J.B. Butt, "Particle Size, Particle Size Distribution and Related Measurements of Supported Metal Catalysts" *Catalysis Reviews*, **29**, 41 (1987).

151. H. Shichijo, L.T. Tran, R.J. Matyi and J.W. Lee., "Prospects for GaAs-on-Si LSI Circuits" *Materials Research Society Proceedings* (`Heteroepitaxy on Silicon II', eds. J.C.C. Fan, J.M. Phillips and B-Y. Tsaur), **91**, 201 (1987).

152. B.W. Shen, J.M. Anthony, P.H. Chang, J.A. Keenan, R.J. Matyi and H.L. Tsai, "Compound Formation and Silicon Behavior in Titanium and Tantalum Layered Aluminum Films" *Material Research Society Symposium Proceedings* (`Thin Films - Interfaces and Phenomena', eds. R.J. Nemanich, P.S. Ho and S.S. Lau) **54**, 103 (1986).

153. R.J. Matyi, "Characterization of Tungsten Silicide and Titanium Silicide Thin Films with a Fully Automated Seemann-Bohlin Diffractometer" *Advances in X-ray Analysis*, **29**, 375 (1986).

154. T.M. Moore, S. Matteson, W.M. Duncan and R.J. Matyi, "Microstructural Characterization of GaAs Substrates" *Material Research Society Symposium Proceedings* (`Materials Characterization', eds. N. Cheung and M.A. Nicolet), **69**, 379 (1986).

155. W.M. Duncan, J.W. Lee., R.J. Matyi and H.Y. Liu, "Photoluminescence and X-ray Properties of Heteroepitaxial Gallium Arsenide on Silicon" *Journal of Applied Physics*, **59**, 2161 (1986).

156. B.W. Shen, G.C. Smith, J.M. Anthony and R.J. Matyi, "Diffusion Barrier Properties of Thin Selective Chemical Vapor Deposited Tungsten Films" *Journal of Vacuum Science and Technology*, **B4**, 1369 (1986).

157. R.J. Matyi and R. Baboian, "An X-ray Diffraction Analysis of the Patina of the Statue of Liberty"

Powder Diffraction, **1**, 299 (1986).

158. R.J. Matyi, J.B. Butt and L.H. Schwartz, "Mössbauer Spectroscopy Observations of Local Temperature Rises in a Silica-Supported Iron Catalyst" *Journal of Catalysis*, **91**, 185 (1985).

159. J.A. Amelse, K.B. Arcuri, J.B. Butt, R.J. Matyi, L.H. Schwartz and A. Shapiro, "Particle Size Determination in Supported α-Fe_2O_3" *Journal of Physical Chemistry*, **85**, 708 (1981).

160. R.J. Matyi, D.R. Uhlmann and J.A. Koutsky, "On the Structure of Glassy Polymers. VII. Small-Angle X-ray Scattering from Epoxy Resins" *Journal of Polymer Science (Polymer Physics Ed.)*, **18**, 1053 (1980).

161. R.J. Matyi and B. Crist, "Small-Angle X-ray Scattering by Poly(Ethylene Terephthalate) Fibers" *Journal of Macromolecular Science - Physics*, **B16**, 15 (1979).

162. R.J. Matyi and B. Crist, "Small-Angle X-ray Scattering by Nylon-6" *Journal of Polymer Science (Polymer Physics Ed.)*, **16**, 1329 (1978).

Unrefereed Publication and Articles

1. R.J. Matyi, "Diffuse X-ray Scattering and Models of Disorder (Book Review)" *MRS Bulletin*, **37**, 288 (2012).
2. W. Li, J.E. Tkaczyk, K.W. Andreini, J. Cui, T. Zhang, Y. Williams, K.G. Harding, J. Chen, G. Bindley and R.J. Matyi, "Electron Mobility and Lifetime Mapping of CZT With Known Crystalline Defects by Pulsed Laser Excitation" *Proc. 2009 IEEE Nuclear Science Symposium and Medical Imaging Conference*, 1658 (2010)
3. K. Fujii, A. Waseda, N. Kuramoto, S. Mizushima, P. Becker, H. Bettin, A. Nicolaus, U. Kuetgens, S. Valkiers, P. Taylor, P. De Bievre, G. Mana, E. Massa and R.J. Matyi, "Present Status of the Avogadro Constant Determination From Silicon Crystals With Natural Isotopic Composition" *2004 Conference on Precision Electromagnetic Digest,* 143 (2004).
4. P. Becker, S. Downes, K. Fujii, M. Kenny, G. Mana, R. Matyi, A. Picard and P. Taylor, "Measurement of the Avogadro Constant and *Mise en Pratique* of an Atomic Definition of the Kilogram by a Si^{28} Single Crystal" *2004 Conference on Precision Electromagnetic Digest*, 146 (2004).
5. C.H. Su, R.F. Brebrick, A. Burger, M. Dudley, R. Matyi, N. Ramachandran, Y.G. Sha, M. Volz and H.D. Shih, "Crystal Growth of ZnSe and Related Ternary Compound Semiconductors by Vapor Transport" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1998) 605 (1999).
6. H.M. Volz and R.J. Matyi, "High Resolution Triple Axis X-ray Diffraction Analysis of II-VI Semiconductor Crystals" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1998) 457 (1999).
7. D.C. Gillies, M.P. Volz, K. Mazurk, S. Motakef, S.; M. Dudley and R. Matyi, "Solidification of II-VI compounds in a rotating magnetic field" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1998) 247 (1999).
8. M. Dudley and R.J. Matyi, "Combined Synchrotron White Beam X-Ray Topography and High Resolution Triple Axis X-Ray Diffraction Characterization and Analysis of Crystals Grown in Microgravity and Ground-Based Environments" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1998) 169 (1999).
9. R.J. Matyi, S.B. Felch, B.S. Lee, M.R. Strathman, J.A. Keenan., Y. Guo and L. Wang, "Process Effects in Shallow Junction Formation by Plasma Doping" *Proc. 4th Int'l Workshop on the Measurement, Characterization and Modeling of Ultra-Shallow Doping Profiles in Semiconductors*, 47.1 (1997).

10. K. Sridharan, J.R. Conrad, F.J. Worzala, A. Chen, A., M. Shamim, R.P. Fetherston, J.P. Blanchard, R.J. Matyi, D.L. Chapek and R.A. Dodd,"Plasma Source Ion Implantation - Science and Technology" *Proc. 9th Int. Conf. Surface Modification Technologies*, 401 (1996).

11. R.J. Matyi, D.P. Brunco, S.B. Felch, E. Ishida, L. Larson, L. Wang and S. Wang, "Materials Properties of B-Doped Si by Low Energy Plasma Source Ion Implantation" *Proc. 11th Int'l Conf. on Ion Implantation Technology*, 749 (1996).

12. C.H. Su, R.F. Brebrick, A. Burger, M. Dudley, R.J. Matyi, N. Ramachandran, Y.G. Sha, M. Volz and H.D. Shih, "Crystal Growth of ZnSe and Related Ternary Compound Semiconductors by Vapor Transport" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1996) 493 (1996).

13. M. Dudley and R.J. Matyi, "Combined Synchrotron White Beam X-Ray Topography and High Resolution Triple Axis X-ray Diffraction Characterization and Analysis of Crystals Grown in Microgravity and Ground-Based Environments" *NASA Conference Publication* (NASA Microgravity Materials Science Conference, 1996) 187 (1996).

14. M.R. Deshpande, J.W. Sleight, M.A. Reed, R.G. Wheeler and R.J. Matyi, "Zeeman Splitting of Single Semiconductor Impurities and Determination of Spin *g** Factor in a Quantum Well" *Proc. 23rd International Conference on the Physics of Semiconductors*, **2**, 1577 (1996).

15. N.R. Perkins, M.N. Horton, R.J. Matyi, Z.Z. Bandic, T.C. McGill and T.F. Kuech, "Growth of Thick GaN Films by Halide Vapor Phase Epitaxy", *Electrochemical Society Proceedings* (Symposium on Chemical Vapor Deposition), **95-5**, 336 (1996).

16. M.R. Deshpande, J.L. Huber, N.H. Dekker, P. Kozodoy,J.W. Sleight, M.A. Reed, C.L. Frenando, W.R. Frensley, R.J. Matyi and Y.C. Kao, "3-D to 0-D Single Electron Tunneling Through Bound States of Donor Impurities in Resonant Tunneling Heterostructures" *Proc. 22rd International Conference on the Physics of Semiconductors*, **3**, 1899 (1995).

17. S.B. Felch, T. Sheng, E. Ganin, K.K. Chan, D.L. Chapek, R.J. Matyi and J.R. Conrad, "Studies of Ultra-Shallow p^+-*n* Junction Formation Using Plasma Doping" *X International Conference on Ion Implantation Technology Extended Abstracts*, P-6.1 (1994).

18. M.R. Deshpande, N.H. Dekker, J.W. Sleight, J.L. Huber, E.S. Hornbeck, M.A. Reed, R.J. Matyi, Y.C. Kao, C.J.L. Fernando and W.R. Frensley, "Observation of Novel Conductance Structure in GaAs/$Ga_xAl_{1-x}As$ Resonant Tunneling Heterostructures" *Proc. IEEE Cornell Conf. in Advanced Concepts in High Speed Semiconductor Devices and Circuits*, 177 (1993).

19. B. Kim, R.J. Matyi, M. Wurtele, K. Bradshaw and H.Q. Tserng, "Boost Performance of Millimeter-Wave Quantum Well Devices" *Microwaves & RF*, **28**, 75 (1989).

20. R.J. Matyi, H.F. Schaake, D.G. Deppe and N. Holonyak, "Epitaxial Layer Misorientation in Heteroepitaxial GaAs on Si" *Electrochemical Society Proceedings* (Symposium on Heteroepitaxial Approaches in Semiconductors: Lattice Mismatch and its Consequences), **89-5**, 195 (1989).

21. H. Shichijo, R.J. Matyi and A.H. Taddiken, "Monolithic Process for Co-Integration of GaAs and Silicon Circuits" *1988 IEDM Technical Digest*, 778 (1988).

22. H. Shichijo, A.H. Taddiken and R.J. Matyi, "GaAs MESFET and Si CMOS Co-Integration and Circuit Techniques" *1988 GaAs IC Symposium Technical Digest*, 239 (1988).

23. A.C. Seabaugh, M.A. Reed, W.R. Frensley, J.N. Randall and R.J. Matyi, "Realization of Pseudomorphic and Superlattice Resonant Tunneling Transistors" *1988 IEDM Technical Digest*, 900 (1988).

24. B. Kim, R.J. Matyi, M. Wurtele, K. Bradshaw and H.Q. Tserng, "Millimeter Wave AlGaAs/InGaAs/GaAs Quantum Well Power MISFET" *1988 IEDM Technical Digest*, 168 (1988).

25. A.C. Seabaugh, W.R. Frensley and R.J. Matyi, "Interpreting Electrical Measurements on III-V

Heterojunction Device Structures" *Texas Instruments Technical Journal*, **5**, 111 (1988).

26. R.J. Matyi, H.F. Schaake, D.G. Deppe and N. Holonyak, "Epitaxial Layer Misorientation in Heteroepitaxial GaAs on Si" *Electrochemical Society Extended Abstracts* **88-2**, 734 (1988).
27. H. Shichijo and R.J. Matyi, "GaAs-on-Silicon Integrated Circuits: Savior for GaAs? or for Si?" *1987 IEDM Technical Digest*, 88 (1987).
28. R.J. Matyi, "X-ray Diffraction Characterization of Semiconductor Materials" *Texas Instruments Technical Journal*, **3**, 85 (1986).
29. T.J. Shaffner, R.J. Matyi, A.E. Stephens and F.O. Meyer, "X-ray Topographic Characterization of Oxygen in Lightly and Heavily Doped Czochralski Silicon" *Electrochemical Society Extended Abstracts* **85-2**, 482 (1985).

Books and Book Chapters

1. R.J. Matyi, *Characterization of Nanostructured Materials – A User's Guide* (Springer Nature), in preparation [*under contract for publication in 2023*].
2. R.J. Matyi and H.M. Volz, "High Resolution Diffuse X-ray Scattering by Protein Crystals: From *hkl* to 000" *From Semiconductors to Proteins: Beyond the Average Structure* (*Fundamental Materials Research*, eds. S.J.L. Billinge and M.F. Thorpe (New York: Kluwer Academic/Plenum), 257 (2002).
3. R.D. Deslattes and R.J. Matyi, "Analysis of Thin Layer Structures by X-ray Reflectometry" *Handbook of Silicon Semiconductor Metrology*, ed. A.C. Diebold (New York: Marcel Dekker), 789 (2001).
4. J.H. Booske, R.J. Matyi and J.R. Conrad, "Plasma Implantation" *Encyclopedia of Electrical and Electronics Engineering*, ed. J.G. Webster (New York: John Wiley), **16**, 520 (1999).
5. R.J. Matyi, "Growth of Quantum Confined Structures by Molecular Beam Epitaxy" *VLSI Electronics Microstructure Science* ('Heterostructures and Quantum Devices'), eds. N.G. Einspruch and W.R. Frensley (San Diego: Academic Press), **24**, 25 (1994).
6. M.A. Reed, J.H. Luscombe, J.N. Randall, W.R. Fresnley, R.J. Aggarwal, R.J. Matyi, T.M. Moore and A.E. Wetsel, "Quantum Dot Resonant Tunneling Spectroscopy" *NATO ASI Series B* (`Science and Engineering of One- and Zero-Dimensional Semiconductors'), eds. S.P. Beaumont and C.M. Sotomayor Corres (New York: Plenum) **214**, 139 (1990).
7. M.A. Reed, J.N. Randall, J.H. Luscombe, W.R. Fresnley, R.J. Aggarwal, R.J. Matyi, T.M. Moore and A.E. Wetsel, "Quantum Dot Resonant Tunneling Spectroscopy" *Festkörperproblem (Advances in Solid State Physics)*, ed. U. Roβler (Braunschweg: Pergamon -Vieweg), **29**, 267 (1989).

Patents and Standard Reference Materials

1. "Evaluation of Thickness, Density and Interface Width of Thin Films by X-Ray Reflectometry: Instrumental Requirements, Alignment and Positioning, Data Collection, Data Analysis and Report" International Organization for Standardization/International Electrotechnical Commission TC 201/SC/WG3 Working Document (submitted November 24, 2009).
2. E.C. Benke and R.J. Matyi, "Standard Sapphire Single Crystal Wafer for Crystalline Orientation" NIST Standard Reference Material 1995 (issued October 8, 2008).
3. E.C. Benke and R.J. Matyi, "Standard Silicon Single Crystal Wafer for Crystalline Orientation" NIST Standard Reference Material 1994 (issued February 6, 2007).
4. H. Shichijo and R.J. Matyi, "Epitaxial Layer on a Heterointerface" U.S. Patent No. 5,959,308 (issued September 28, 1999).
5. H. Shichijo and R.J. Matyi, "Method of Forming an Epitaxial Layer on a Heterointerface" U.S. Patent

No. 5,238,869 (issued August 24, 1993, co-issued by the European Patent Office as EP0352472 and the Japan Patent Office as JP2161718).

6. R.J. Matyi and H. Shichijo, "Heteroepitaxial Selective-Area Growth Through Insulator Windows" U.S. Patent No. 4,914,053 (issued April 3, 1990).

Contributed and invited presentations

1. "The Role of Materials Characterization in Green Technology R&D" USA-India Workshop on the Next Generation Green Chemistry/Engineering and Technologies Graduate Program, Lakeland, FL (10/24/19) (Invited)
2. "X-ray Scattering for Semiconductor Metrology: From the Undergrad Lab to the sub-5nm Manufacturing Node" Materials Research Laboratory, University of Illinois, Urbana-Chappaign, IL (09/23/19) (Invited)
3. "Synthesis and Characterization of Carbon Quantum Dots" USA-India Workshop on the Next Generation Green Chemistry/Engineering and Technologies Graduate Program, Lakeland, FL (07/19/18)
4. "Integrating Undergraduate Interns into an X-ray Diffraction Infrastructure" American Crystallographic Association 67th Annual Meeting, New Orleans, LA (05/27/17)
5. "Florida Polytechnic: News From the Front Lines of the Startup of a STEM University" SUNY Polytechnic Seminar Series, Albany, NY (02/10/17) (Invited)
6. "High Brightness Synchrotron Sources for X-ray Metrology in Semiconductor Manufacturing" 2015 Joint National Synchrotron Light Source II (NSLS-II) and Center for Functional Materials (CFN) Users' Meeting (Workshop 5: Semiconductor Technology Development Through Characterization by Synchrotron and Electron Microscopy Techniques) Brookhaven National Laboratory, Upton, NY (5/20/15) (Invited)
7. "Structure Evolution In CIGS Deposition: An X-ray Diffraction Analysis With Rietveld Whole-Pattern Refinement" 40th IEEE Photovoltaic Specialists Conference, Denver, CO (06/10/14)
8. "Potential *in situ* characterization of physical vapor deposition of CIGS film growth at ISR and other relevant NSLS-II beamlines" 2014 NSLS/NSLS-II & CFN Joint Users' Meeting (Workshop 6: In Situ Probes for Investigating Solar Energy Conversion), Brookhaven National Laboratory, Upton, NY (5/21/14) (Invited)
9. "Education in Nanotechnology: Why It Matters" Regional Technical Awareness Day Endnote Presentation, Boards of Cooperative Educational Services (BOCES) Northeastern Regional Information Center, Albany, NY (12/6/13) (Invited)
10. "Current Status of Critical Dimension Small Angle X-ray Scattering for Advanced Device Structures" Japan Society of Applied Physics - Materials Research Society Joint Symposia, Kyoto, JAPAN (9/17/13)
11. "Future Directions of Science on Exposed and Buried Interfaces with Advanced X-ray Techniques" Japan Society of Applied Physics - Materials Research Society Joint Symposia, Kyoto, JAPAN (9/17/13)
12. "High Resolution X-ray Reflectometry for Surface- and Near-surface Analysis" 35th American Vacuum Society Symposium on Applied Surface Analysis, Urbana, IL (6/5/13) (Invited)
13. "Statistical Dynamical Diffraction Theory: Application to Partially Relaxed and Defective SiGe Heterostructures" 11th Biennial Conference on High Resolution X-Ray Diffraction and Imaging, St. Petersburg, RUSSIA (09/19/12)

14. "On the Sensitivity of Measurements of Density-in-Depth by Specular X-ray Reflectometry" 11th Biennial Conference on High Resolution X-Ray Diffraction and Imaging, St. Petersburg, RUSSIA (09/17/12)
15. "X-Ray Reflectometry Analyses of Nanostructured Materials" Denver X-ray Conference, Denver, CO (08/06/12) (Invited)
16. "Observations and Comments on Nanomanufacturing" National Science Foundation Special Seminar, Arlington, VA (02/06/12) (Invited)
17. "Structural and Thermo-Mechanical Properties of EUV Photoresist Systems from Ambient and High Temperature X-ray Reflectometry" 10th Biennial Conference on High Resolution X-ray Diffraction and Imaging, Coventry, ENGLAND (09/21/10)
18. "Statistical Dynamical X-ray Diffraction Analysis of Highly Defective Structures" 10th Biennial Conference on High Resolution X-ray Diffraction and Imaging, Coventry, ENGLAND (09/21/10)
19. "Room Temperature and Temperature-Dependent Specular X-ray Reflectometry Analyses of Extreme Ultraviolet Photoresists" 7th LEPTOS Workshop, Minsk, BELARUS (07/20/10) (Invited)
20. "High Resolution X-ray Diffraction Analysis of Strain and Relaxation in Carbon-Doped Silicon" 7th LEPTOS Workshop, Minsk, BELARUS (07/19/10) (Invited)
21. "Near Surface Semiconductor Metrology with Modern X-ray Scattering Methods" Symposium II (Metrology, Reliability and Test), China Semiconductor Technology International Conference 2010, Shanghai, CHINA (to be presented 03/19/10) (Invited)
22. "The Development of a Comprehensive Undergraduate Degree Program in Nanoscale Science" Materials Research Society Fall Meeting, Boston, MA (to be presented 12/03/09)
23. "Porosity and Thermo-Mechanical Properties of Low-*k* Dielectrics" New York Center for Advanced Interconnect Science and Technology (CAIST) Technical Workshop, Albany, NY (to be presented 10/29/09)
24. "What Will You Do When You Grow Up? The Pros and Cons of Being a Scientist in Industry, Academia, and the U.S. Government" Union College Mechanical Engineering Seminar, Schenectady, NY (10/02/09) (Invited)
25. "The Development of a Comprehensive Undergraduate Degree Program in Nanoscale Science" Symposium on Advances in Higher Education in Nanoscale Science and Engineering, Albany, NY (08/08/09) (Invited)
26. "Application of Statistical Dynamical X-ray Diffraction Theory to Defective Semiconductor Heterostructures" 2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics, Albany, NY (05/14/09)
27. "A High Resolution X-Ray Reflectometry Study Of Extreme Ultraviolet Photoresists" 2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics, Albany, NY (05/14/09)
28. "A Critical Comparison of X-ray Scattering Methods for Porosity Metrology of Low-κ Thin Films" 2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics, Albany, NY (05/12/09)
29. "Modern X-ray Scattering Methods for Nanoscale Materials Analysis" Korea Research Institute for Science and Standards, Daejon, KOREA (01/23/09) (Invited)
30. "X-ray Metrology in Modern Semiconductor Manufacturing" SEMI Inspection Technology Seminar, SEMICON Korea 2009, Seoul, KOREA (01/21/09) (Invited)
31. "The College of Nanoscale Science and Engineering at the University at Albany – A New Partnership

Model for Education in Nanotechnology" Global Nanoscale Science and Engineering Education Workshop, Washington, DC (11/12/08) (Invited)

32. "Porosity and Thermo-Mechanical Properties of Low-*k* Dielectrics" New York Center for Advanced Interconnect Science and Technology (CAIST) Technical Workshop, Albany, NY (10/27/08)
33. "Defect Generation In Carbon-Doped Silicon: A High Resolution X-Ray Diffraction Study" 9th European Symposium on X-ray Topography and High Resolution Diffraction, Linz, AUSTRIA (09/16/08)
34. "A High Resolution X-Ray Reflectometry Study of Extreme Ultraviolet Photoresists" 9th European Symposium on X-ray Topography and High Resolution Diffraction, Linz, AUSTRIA (09/16/08)
35. "Modern X-ray Scattering Methods for Nanoscale Materials Analysis" National Center for Learning and Teaching in Nanoscale Science and Engineering, Northwestern University, Evanston, IL 09/04/08 (Invited)
36. "Modern X-ray Scattering Methods for Nanoscale Materials Analysis" Physics and Materials Science Seminar, Rensellaer Polytechnic Institute, Troy, NY 06/24/08 (Invited)
37. "Advanced X-ray Metrology for Advanced Interconnect Structures" New York Center for Advanced Interconnect Science and Technology (CAIST) Spring Technical Workshop, Albany, NY 04/17/08
38. "High Resolution X-ray Reflectometry in Modern Semiconductor Manufacturing" Workshop on Frontiers in X-ray Materials Analysis, Toronto, ON 09/26/07 (Invited)
39. "High Resolution X-ray Reflectometry and Diffractometry in Modern Semiconductor Manufacturing" National Synchrotron Light Source Symposium, Brookhaven National Laboratory, Upton, NY 05/02/07 (Invited)
40. "X-ray Reflectometry and Small-Angle X-ray Scattering: Critical Tools for Nanoscale Characterization and Metrology" Tunghai University, Tai'Chung, TAIWAN 10/02/06 (Invited)
41. "X-ray Scattering Methods for Thin Film and Nanostructure Analysis" 2006 APEC (Asia-Pacific Economic Cooperation) Nanoscale Technology Measurement Forum, Taipei, TAIWAN 09/28/06 (Invited)
42. "High Resolution X-ray Diffraction Analyses of Ion-Implanted GaN/AlN/Si Heterostructures" 8th European Symposium on X-ray Topography and High Resolution Diffraction, Baden-Baden, GERMANY 09/21/06
43. "High Resolution X-Ray Diffraction Analyses of Manganese-Implanted Ferromagnetic Silicon" 8th European Symposium on X-ray Topography and High Resolution Diffraction, Baden-Baden, GERMANY 09/21/06
44. "Si/SiC Multilayers for Thermoelectric Generators – A High Resolution X-Ray Reflectometry Study" 8th European Symposium on X-ray Topography and High Resolution Diffraction, Baden-Baden, GERMANY 09/19/06
45. "High Resolution X-ray Reflectometry: A Critical Tool for Thin Film Characterization and Metrology" Workshop on Frontiers in X-ray Materials Analysis, Boston, MA 09/13/06 (Invited)
46. "High Resolution X-ray Reflectometry and Diffractometry in Modern Semiconductor Manufacturing" 55th Denver X-ray Conference, Denver, CO 08/10/06 (Invited)
47. "High Resolution X-ray Reflectometry: A Critical Tool for Thin Film Characterization and Metrology" Workshop on Frontiers in X-ray Materials Analysis, San Francisco, CA 06/07/06 (Invited)
48. "High Resolution X-ray Reflectometry: A Critical Tool for Thin Film Characterization and Metrology" Microelectronics Engineering Seminar, Rochester Institute of Technology, Rochester, NY 10/14/05 (Invited)
49. "High Resolution X-ray Reflectometry: A Critical Tool for Thin Film Characterization and Metrology"

Workshop on Frontiers in X-ray Materials Analysis, Cambridge, MA 10/05/05 (Invited)

50. "Advanced X-ray Reflectometry Methods for Nanotechnology Materials Metrology" Versailles Project on Advanced Materials and Standards (VAMAS), Workshop on X-ray Reflectivity Measurements for Evaluation of Thin Films and Multilayers Thickness, Università di Brescia, Brescia, ITALY 09/01/05 (Invited)
51. "High Resolution X-ray Reflectometry – A Critical Tool for Nanostructure Metrology and Characterization" Materials Science Seminar, University of New Hampshire, Durham, NH 04/14/05 (Invited)
52. "X-ray Reflectometry and Small-Angle X-ray Scattering: Critical Tools for Nanostructure Metrology and Characterization" 12th SPIE Annual International Symposium on Smart Structures and Materials, San Diego, CA 03/09/05 (Invited)
53. "High Resolution X-ray Scattering from Structurally Defective Protein Crystals" Workshop on Emerging Areas in Biological Crystallography, Advanced Phtoton Source, Argonne National Laboratory, Argonne, IL 07/24/04 (Invited)
54. "Applications of a Precision Lattice Parameter Comparison System to the Analysis of Monoisotopic Silicon" 2nd Workshop on High-Purity Monoisotopic Silicon, Nizhny Novgorod, RUSSIA 6/20/03
55. "High Resolution X-ray Diffractometry and Reflectometry for Semiconductor Materials Characterization" American Physical Society March Meeting, Austin, TX 03/04/03 (Invited)
56. "Issues in High Resolution X-ray Reflectometry Analyses of High-*k* Materials" SEMATECH Analytical Laboratories Managers Meeting, Austin, TX 02/04/03 (Invited)
57. "Accuracy and Precision in High Resolution X-ray Scattering" University of North Texas, Denton, TX 12/04/02 (Invited)
58. "High Resolution X-ray Scattering from Structurally Defective Protein Crystals" Brookhaven National Laboratory, Upton, NY 11/07/02 (Invited)
59. "Accuracy and Precision in High Resolution X-ray Scattering" State University of New York, Stony Brook, NY 11/06/02 (Invited)
60. "High Resolution X-ray Reflectometry: Theory, Practice, Accuracy and Precision" Electro-chemical Society 202nd Meeting, Salt Lake City, UT 10/24/02 (Invited)
61. "High Resolution X-ray Scattering: Theory, Practice, Accuracy and Precision" Materials Science Seminar, Virginia Tech, Blacksburg, VA 10/11/02 (Invited)
62. "Design and Implementation of a Metrologically Sound X-ray Reflectometer" 6th European Symposium on X-ray Topography and High Resolution Diffraction, Grenoble, FRANCE 9/13/02
63. "X-ray Reflectivity Study of HfO_2 and ZrO_2 High-*k* Thin Film Structures" 6th European Symposium on X-ray Topography and High Resolution Diffraction, Grenoble, FRANCE 9/13/02
64. "High Resolution X-ray Analytical Methods: Theory, Practice, Accuracy and Precision" National Institute of Standards and Technology, Boulder, CO 3/19/02 (Invited)
65. "High Resolution Triple Axis X-ray Diffraction Study Of Radiation Damage In Lysozyme Crystals" Materials Research Society Fall Meeting, Boston, MA 11/27/01
66. "New Directions in X-ray Analysis at the National Institute of Standards and Technology", CCM Working Group of the Avogadro Constant National Institute of Advanced Industrial Science and Technology, Tsukuba, JAPAN 11/1/01 (Invited)
67. "High Resolution Diffuse X-ray Scattering by Protein Crystals – From *hkl* to 000" Michigan State University Workshop ('From Semiconductors to Proteins: Beyond the Average Structure'), Traverse City, MI 7/31/01 (Invited)

68. "Advanced X-ray Scattering Methods for Microelectronic Materials Characterization" Analytical Laboratory Mangers Council Meeting, Newport Beach, CA 3/7/01 (Invited)
69. "Triple Axis X-ray Diffraction Analyses of Protein Crystals" 5th European Symposium on X-ray Topography and High Resolution Diffraction, Ustroń-Jaszowiec, POLAND 9/14/00
70. "A High Resolution Triple Axis X-ray Diffraction Analysis of Radiation Damage in Lysozyme Crystals" 8th International Conference on the Crystallization of Biological Macromolecules, Sandestin, FL 05/19/00
71. "X-ray Diffraction and Scattering – Current Developments and Coming Attractions" Ohio State Univerisity Materials Science and Engineering Symposium, Columbus, OH 12/10/99 (Invited)
72. "High Resolution Triple Axis X-ray Diffraction Analyses of Lysozyme Crystals" 57th Pittsburgh Diffraction Conference, Columbus, OH 10/21/99 (Invited)
73. "Recent Advances in High Resolution Triple Axis X-ray Diffraction" Georgia Institute of Technology Materials Science Symposium, Atlanta, GA 10/29/98 (Invited)
74. "Statistically-Based Analysis of Rocking Curves from Defective Structures" 4th European Symposium on X-ray Topography and High Resolution Diffraction, Durham, ENGLAND 9/9/98
75. "High Resolution X-ray Diffraction Analysis of GaN/$LiGaO_2$" 4th European Symposium on X-ray Topography and High Resolution Diffraction, Durham, ENGLAND 9/9/98
76. "Compliant Substrates – A Novel Approach for the Growth of Lattice-Mismatched Materials" 1998 Space Power Workshop, Long Beach, CA 4/8/98 (Invited)
77. "X-ray Diffraction Analysis of Compliant Substrate Materials and Alternative Substrates for GaN Growth" ONR Workshop on Bonded and Compliant Substrates, San Juan, PR 2/1/98
78. "Plasma Source Ion Implantation: The Confluence of Plasma Science and Materials Science" American Vacuum Society 44th Nationall Symposium, San Jose, CA 10/20/97 (Invited)
79. "Characterization of Dislocations in Bulk II-VI Semiconductors by High Resolution X-ray Diffraction" 46th Annual Denver X-ray Conference, Steamboat Springs, CO 8/6/97
80. "High Resolution X-ray Diffraction Analysis of Gallium Nitride/Silicon Carbide Heterostruc-tures" 46th Annual Denver X-ray Conference, Steamboat Springs, CO 8/6/97
81. "Aspects of Simulating High Resolution Triple Crystal Diffraction Reciprocal Space Maps" 46th Annual Denver X-ray Conference, Steamboat Springs, CO 8/6/97
82. "Diffractometer Noise Characteristics: Experimental Determination and Application to Rocking Curve Analysis" 46th Annual Denver X-ray Conference, Steamboat Springs, CO 8/6/97
83. "Process Effects in Shallow Junction Formation by Plasma Doping" 4th International Workshop on the Measurement, Characterization and Modeling of Ultra-Shallow Doping Profiles in Semiconductors, Research Triangle Park, NC 4/7/97
84. "Boron Doping of Silicon by Plasma Source Ion Implantation" 3rd International Workshop on Plasma-Based Ion Implantation, Dresden, GERMANY 9/16/96 (Invited)
85. "High Resolution X-ray Diffraction Analysis of Silicon-on-Insulator Structures" 45th Annual Denver X-ray Conference, Denver, CO 8/5/96
86. "Materials Properties of B-Doped Si by Low Energy Plasma Source Ion Implantation" 11th International Conference on Ion Implantation Technology, Austin, TX 6/19/96
87. "Quantitative Analysis of Crystal Defects by Triple Crystal X-ray Diffraction" Microgravity Materials Science Conference, Huntsville, AL 6/9/96

88. "An Automated Statistical Procedure for the Fitting of Double Crystal X-ray Rocking Curves" 3rd European Symposium on X-ray Topography and High Resolution Diffraction, Palermo, ITALY 4/24/96
89. "High Resolution X-ray Diffraction Analysis of GaN Grown by Halide Vapor Phase Epitaxy", Materials Research Society Spring Meeting, San Francisco, CA 4/9/96
90. "Structural Characterization Of GaAs Grown At Low Temperatures By Molecular Beam Epitaxy" 2nd European Symposium on X-ray Topography and High Resolution Diffraction, Berlin, GERMANY 9/5/94
91. "High Resolution X-ray Diffraction Characterization of Ge/Si/GaAs Heterostructures" 2nd European Symposium on X-ray Topography and High Resolution Diffraction, Berlin, GERMANY 9/5/94
92. "Characterization of Reactive Ion Etch Damage in Gaas by Triple Crystal X-ray Diffraction" Materials Research Society Fall Meeting, Boston, MA 12/2/93
93. "Structural Analysis of Silicon Doped by Plasma Source Ion Implantation" Materials Research Society Fall Meeting, Boston, MA 12/1/93
94. "Stability of GaAs/Si Superlattices During MBE Growth and Post-Growth Annealing" Materials Research Society Fall Meeting, Boston, MA 11/30/93
95. "X-ray Diffraction Analysis of Surface Modification in Semiconductor Materials" University of Illinois - Champaign/Urbana, IL 11/8/93 (Invited)
96. "X-ray Diffraction Analysis of Surface Modification in Semiconductor Materials" University of Wisconsin, Milwaukee, WI 10/5/93 (Invited)
97. "Structural Characterization of Plasma-Doped Silicon by High Resolution X-ray Diffraction" 1st International Workshop on Plasma-Based Ion Implantation, Madison, WI 8/5/93
98. "High Resolution X-ray Diffraction Analyses of Low Temperature Gallium Arsenide" Materials Research Society Spring Meeting, San Francisco, CA 4/12/93 (Invited)
99. "Characterization of Chemical-Mechanical Polished GaAs by Triple Crystal X-ray Diffrac-tion" 1st European Symposium on X-ray Topography and High Resolution Diffraction, Marseilles, FRANCE 7/8/92
100. "High Resolution X-ray Diffraction Characterization of Si/GaAs Superlattices" 1st European Symposium on X-ray Topography and High Resolution Diffraction, Marseilles, FRANCE 7/8/92
101. "Structural Properties of Si/GaAs Superlattices" Electronic Materials Conference, Cambridge, MA 6/25/92
102. "Structure of As-Grown and Annealed Low Temperature Gallium Arsenide: A High Reso-lution X-ray Diffraction Study" Electronic Materials Conference, Cambridge, MA 6/25/92
103. "Surface Characterization of Chemical-Mechanical Polished GaAs by Inclined Bragg Plane Triple Crystal Diffraction" Materials Research Society Spring Meeting, San Francisco, CA 4/28/92
104. "MBE Growth and Structural Characterization of Si/GaAs Superlattices" Materials Research Society Spring Meeting, San Francisco, CA 4/29/92
105. "A New Parametric Method for the Analysis of Ordering Configurations in Binary Solid Alloys" Materials Research Society Spring Meeting, San Francisco, CA 5/1/92
106. "The Semiconductor Heterointerface as a Grain Boundary -- Implications for Epitaxial Layer Misorientation" Northwestern University Progress in Materials Science Colloquia, Evanston, IL 3/5/91 (Invited)
107. "Epitaxial Layer Misorientation in CdTe on GaAs" Materials Research Society Fall Meeting, Boston, MA 11/29/90

108. "Effect of the Extinction Distance in X-ray Rocking Curve Analyses of II-VI Compounds" Materials Research Society Fall Meeting, Boston, MA 11/28/90

109. "Selected Area Heteroepitaxial Growth of GaAs on Silicon for Advanced Device Structures" International Conference on Metallurgical Coatings, San Diego, CA 4/20/89 (Invited)

110. "Current Status of Epitaxial GaAs on Silicon" U.S. Dept. of Energy Council on Materials Workshop (`Materials Science of Epitaxial Structures'), Monterey, CA 1/11/89 (Invited)

111. "Epitaxial Layer Misorientation in Heteroepitaxial GaAs-on-Si" Electrochemical Society Fall Meeting, Chicago, IL 10/12/88

112. "The Epitaxial Growth of Gallium Arsenide on Silicon" University of Wisconsin Materials Science Seminar Series, Madison, WI 09/29/88

113. "Properties of Patterned Gallium Arsenide on Silicon" Materials Research Society Spring Meeting, Reno, NV 04/5/88

114. "Issues Facing the Integration of GaAs and Si Electronic Devices" Materials Research Society Spring Meeting, Reno, NV 04/5/88 (Invited)

115. "Patterned Growth of Gallium Arsenide on Silicon" Eighth Molecular Beam Epitaxy Workshop, Los Angeles, CA 09/10/87

116. "Quantization of the Hall Effect in a 3-Dimensional Quasiperiodic System" 3rd International Conference on Superlattices, Microstructures and Microdevices, Chicago, IL 08/17/87

117. "Substrate Orientation and Processing Effects on GaAs/Si Misorientation in GaAs-on-Si Grown by MBE" Electronic Materials Conference, Santa Barbara, CA 06/26/87

118. "Patterned Growth of Gallium Arsenide on Silicon" AFOSR Workshop on Future Opportunities Through GaAs on Si, Marina del Rey, CA 06/18/87 (Invited)

119. "Misfit Accommodation in Epitaxial Systems - A Comparison Between (Hg,Cd)Te on CdTe and GaAs on Si" Univ. of Wisconsin Materials Science Seminar, Madison, WI 06/08/87

120. "X-ray Diffraction and the Statue of Liberty" 3M Technical Forum, St. Paul, MN 05/08/87 (Invited)

121. "Polycrystalline Thin Film Characterization with a Fully Automated Seemann-Bohlin Diffractometer" Siemens Users Group Meeting, San Francisco, CA 01/28/87 (Invited)

122. "Structure and Properties of II-VI Compound Semiconductor Epitaxial Layers and Superlattices" American Crystallographic Association, Hamilton, ON 06/23/86

123. "X-ray Characterization of II-VI Compounds" Northwestern University, Evanston, IL 06/06/86

124. "X-ray Diffraction and the Statue of Liberty" Siemens Users Group Meeting, Chicago, IL 06/05/86 (Invited)

125. "Polycrystalline Thin Film Characterization with a Fully Automated Seemann-Bohlin Diffractometer" Siemens Users Group Meeting, Chicago, IL 06/04/86 (Invited)

126. "Characterization of II-VI Compound Semiconductor Epitaxial Layers and Superlattices" Dept. of Applied Physics Symposium, University of Texas, Arlington, TX 03/27/86 (Invited)

127. "X-ray Diffraction and the Statue of Liberty" North Texas Materials Characterization Society, Dallas, TX 12/11/85

128. "X-ray Topographic Characterization of Oxygen in Lightly and Heavily Doped Czochralski Silicon" Electrochemical Society Fall Meeting, Las Vegas, NV 10/16/85

129. "Characterization of Tungsten Silicide and Titanium Silicide Thin Films with a Fully Automated Seemann-Bohlin Diffractometer" 34th Annual Denver X-ray Conference, Snowmass, CO 08/07/85

Research collaborations and consultations

1. Husch Blackwell LLP, Chicago, IL
2. Signal Relief, Provo, UT
3. ArrMaz, Mulberry, FL
4. Natural Immunogenics Corporation, Sarasota, FL
5. Rigaku Corporation, Tokyo, JAPAN
6. GlobalFoundries, Malta, NY
7. Veeco Corporation, Somerset, NJ
8. Nicopure, Tallahassee, FL
9. Crystal IS, Inc., Green Island, NY
10. Bruker AXS, Madison, WI
11. Bede Scientific Instruments, Inc., Englewood, CO
12. Eaton Corporation, Milwaukee, WI
13. Irell & Manella LLP, Los Angeles, CA
14. North Eastern Analytical Services, Boston, MA
15. Rayovac Corporation, Madison, WI
16. Rudolph Technologies, Flanders, NJ

Teaching Experience

Florida Polytechnic University

1. College of Engineering – BME 4575C: Nanoscale Interface with Lab
2. College of Engineering – BME 4575: Nanoscale Interfaces
3. College of Engineering – EGN 1002: Introduction to Engineering
4. College of Engineering – EGN 1006C: Introduction to Engineering Design
5. College of Engineering – EGN 3343: Engineering Thermodynamics
6. College of Engineering – EGN 3365: Structure and Properties of Materials
7. College of Engineering – EGN 3416L: Design 1
8. College of Engineering – EGN 5419: Advanced Design and Instrumentation for Engineers
9. College of Engineering/College of Innovation and Technology – EGS/ENT 5930: Current Trends in Engineering, Technology, and Innovation
10. College of Engineering – EMA 3050: Introduction to Inorganic Materials
11. College of Engineering – EMA 3066: Introduction to Organic Materials (Polymers)
12. College of Engineering – EMA 3083/3084: Fundamentals of Nanomaterials and Nanotechnology
13. College of Engineering – EMA 3100: Thermodynamics
14. College of Engineering – EMA 3530C: Introduction to Characterization and Analysis
15. College of Engineering – EMA 3811: Multifunctional Materials
16. College of Engineering – EML 4532C: Advanced Materials and Nanotechnology Instrumentation

College of Nanoscale Science and Engineering, University at Albany/SUNY Polytechnic

1. College of Nanoscale Science and Engineering – NSCI 220: Structure of Matter
2. College of Nanoscale Science and Engineering – NENG 301: Thermodynamics and Kinetics of Nanoscale Materials
3. College of Nanoscale Science and Engineering – NSCI/NENG 390: Capstone Research/ Design I
4. College of Nanoscale Science and Engineering – NNSE 506: Foundations of Nanotechnology I (Nanoscale Kinetics and Transport)
5. College of Nanoscale Science and Engineering – NNSE 509: Foundations of Nanotechnology IV (Nanoscale Surfaces and Interfaces)
6. College of Nanoscale Science and Engineering – NNSE 519: Principles of Materials Nano-engineering
7. College of Nanoscale Science and Engineering – NNSE 673: X-ray Scattering and Crystallography for Nanoscale Materials and Structures

University of Wisconsin – Madison

1. College of Engineering – MS&E 150: Materials Science for Non-Engineers
2. College of Engineering – MS&E 250: Introduction to Modern Materials
3. College of Engineering – MS&E 333: Microprocessing of Materials
4. College of Engineering – MS&E 350: Materials Science – Structure and Property Relations in Solids
5. College of Engineering – MS&E 379: Materials Systems and Design Project
6. College of Engineering – MS&E 401: Special Topics – Processing of Electronic Materials
7. College of Engineering – MS&E 448: Crystallography and X-ray Diffraction
8. College of Engineering – MS&E 732: Quantum Theory of Alloy Phases
9. College of Engineering – MS&E 801: Special Topics in Materials Science – The Dynamical Theory of X-ray Diffraction
10. College of Engineering – MS&E 806: Special Topics in Matl's Processing – Molecular Beam Epitaxy

Professional development teaching and training

1. "High Resolution X-ray Reflection and Diffraction Methods for Thin Film Characterization" American Vacuum Society, Registered Short Course instructor (ongoing).
2. "Advanced Methods in High Resolution X-ray Diffraction Analysis" Bruker-AXS Technical Webinar, 12/13/11.
3. "An Introduction to X-Ray Reflectometry" Bruker-AXS Technical Webinar, 10/05-06/10.
4. "Getting Started With Bruker LEPTOS" Bruker-AXS Technical Webinar, 09/24-25/09.
5. "High Resolution X-ray Scattering Methods for Nanostructure Characterization and Metrology " 2009 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics Short Course, Albany, NY 05/11/09
6. "High Resolution X-ray Scattering Methods for Thin Film Materials Analysis" Pennsylvania State University, Materials Characterization Laboratory Short Course, State College, PA 08/17/07
7. "High Resolution X-ray Reflection and Diffraction Methods for Thin Film Characterization" 55th Denver X-ray Conference Short Course, Denver, CO 08/07/06

8. "High Resolution X-ray Diffractometry and Reflectometry for Semiconductor Materials Characterization" 2005 International Conference on Characterization and Metrology for USLI Technology Short Course, Richardson, TX, 03/14/05
9. "High Resolution X-ray Diffractometry and Reflectometry for Semiconductor Materials Characterization" 2003 International Conference on Characterization and Metrology for USLI Technology Short Course, Austin, TX, 03/24/03
10. "High Resolution X-ray Diffraction and Reflectometry for Materials Characterization" University of Minnesota Center for Interfacial Engineering Master Class, Minneapolis, MN 9/22-23/94
11. "High Resolution X-ray Diffraction Analysis of Semiconductor Materials" National Technical University video seminar 2/12/93
12. "X-ray Characterization of Thin Films" 41st Annual Denver X-ray Conference Short Course, Colorado Springs, CO 8/3/92

Graduate student/postdoc advisement

Graduate students, College of Nanoscale Science and Engineering

1. Charles Settens – Ph.D., 2015
   Dissertation: "Critical dimension small-angle X-ray scattering (CD-SAXS) for advanced semiconductor metrology"
2. Paul Shreeman – Ph.D., 2012
   Dissertation: "Modified Statistical Dynamical Diffraction Theory: A Novel Metrological Analysis Method for Partially Relaxed and Defective C-doped Si and SiGe heterostructures"

Graduate students, University of Wisconsin – Madison

Ph.D. students:

1. Heather M. Volz – Ph.D., 2001
   Dissertation: "High resolution X-ray diffraction investigation of radiation damage in hen egg white lysozyme crystals"
2. Hongyu Yao – Ph.D., 2001
   Dissertation: "An investigation into chemical-mechanical polishing process of zinc selenide"
3. Moon Chun – Ph.D., 1999
   Dissertation: "High dose rate effects in silicon using plasma source ion implantation"
4. Thomas W. Staley – Ph.D., 1997
   Dissertation: "Statistical optimization and analysis of X-ray rocking curves : application to epitaxial alloys of silicon, germanium, and gallium arsenide"
5. Peter D. Moran – Ph.D., 1997
   Dissertation: "A method for interpreting high resolution two-dimensional reciprocal space maps of Bragg-diffracted X-ray intensity in terms of the defect structure present in semiconductor hetrostructures"
6. David L. Chapek – Ph.D., 1995
   Dissertation: "Optimization of a plasma doping technique for ultra-shallow junction formation in silicon"
7. Victor S. Wang – Ph.D., 1995
   Dissertation: "High resolution X-ray diffraction investigation of process-induced damage in gallium arsenide"

M.S. students:

1. Heather M. Volz (1999)
2. Hongyu Yao (1999)
3. Robert M. Ulfig (1999)
4. Moon Chun (1997)
5. Thomas W. Staley (1995)
6. David L. Chapek (1995)
7. Hugh M. Gillespie (1994)
8. Victor S. Wang (1993)
9. Peter D. Moran (1992)

Postdoctoral fellow supervision

1. Dr. M. Hanke (2003 – 2004)
   Research area: Precision lattice parameter measurements
2. Dr. J. ConFoo – (1999-2000)
   Research area: *in situ* high resolution X-ray scattering
3. Dr. L. Wang – (1999-2000)
   Resarch area: X-ray interferometry
4. Dr. C. Salles da Costa – (1995 – 1997)
   Research area: Modeling of diffuse X-ray scattering from II-VI semiconductors

Relevant Service Activities

Florida Polytechnic University

1. Academic Program Coordinator, BS Mechanical and Industrial Engineering (2015 – 2016)
2. Chair, Faculty Professional Interests Committee (2015 – 2017; 2019 – present)
3. Member, University Institutional Effectiveness Committee (2015 – 2016)
4. Member, President's Strategic Study Plans: Academic Initiatives (2015 – 2016)
5. President, Florida Polytechnic chapter, Union of Florida Faculty (2016 – 2018); Vice President, Florida Polytechnic chapter, Union of Florida Faculty (2018 – 2020)

College of Nanoscale Science and Engineering, University at Albany/SUNY Polytechnic

1. Vice-Chair, CNSE Faculty Assembly (2014 – 2015)
2. Chair, CNSE Governance Council (2014 – 2015)
3. Chair, CNSE Undergraduate Academic Council (2014 – 2015)
4. Chair, *ad hoc* ABET Preparations Committee, CNSE (2013 – 2015)
5. Chair, Academic Infrastructure Committee, CNSE (2012 – 2014)
6. Chair, Undergraduate Curriculum Committee, CNSE (2011 – 2014)
7. Chair, General Education Assessment Committee, University at Albany (2010 – 2012)
8. Faculty Senator, CNSE Faculty Council (2011 – 2015)
9. Member, Council on Academic Assessment, University at Albany (2009 – 2012)
10. Member, General Education Assessment Committee, University at Albany (2009 – 2012)

11. Faculty Senator, University Senate, University at Albany (2010 – 2011)
12. Member, Senate Executive Committee, University at Albany (2010 – 2011)
13. Chair, Council on Academic Assessment, University at Albany (2010 – 2011)
14. CNSE representative, Department of Mathematics faculty search committee (2010)
15. Co-chair, Symposium on Advances in Higher Education in Nanoscale Science and Engineering, Albany, NY (August 5 - 9, 2009)
16. Member, Educational Offerings and General Education Subcommittee, Middle States Commission on Higher Education Accreditation Self-Study, Univ. at Albany (2008 – 2009)
17. Member, Library Committee, University at Albany (2007 – 2009)
18. Member, Library Collections Advisory Committee, University at Albany (2005 – 2006)
19. Faculty Senator, CNSE Faculty Senate (2010 – 2011)
20. Member, Committee on Appointments, Promotions and Continuing Appointments, CNSE (2009 – present)
21. Graduate Curriculum Committee, CNSE
    - Chair (2006 – 2008)
    - Member (2005 – 2015)
    - Chair, *ad hoc* Committee for revision of the graduate curriculum (2005 – 2006)
    - Chair, *ad hoc* Subcommittee for undergraduate curriculum development (2007)
22. Unofficial coordinator for the CNSE Undergraduate Program (2007 – 2009): Under the direction of the Vice President of Academica Affairs, responsible for numerous formative aspects of the CNSE undergraduate program through activities including, but not limited to:
    - Serving on the CNSE undergraduate admissions committe
    - Recruiting and assisting CNSE faculty members for the development and subsequent teaching of undergraduate courses
    - Planning of undergraduate laboratory experiments, purchasing and installation of laboratory instrumentation, and demonstration and initiation of teaching laboratories in support of the undergraduate curriculm
    - Serving as the facilitator for CNSE academic assessment activities, with a particular focus on undergraduate courses (as directed by the CNSE Faculty Council)
        - ⇒ Formal and informal advising of the incoming CNSE undergraduate students
        - ⇒ Developing of assessment procedures appropriate to the undergraduate program
        - ⇒ Developing of formal relationships with the ABET for accreditation
        - ⇒ Advocating for the CNSE undergraduate degree programs in a variety of in-house, local, and regional presentations
        - ⇒ Meeting with prospective students (and their parents) in both formal and informal recruiting efforts
23. Member, Executive Council, CNSE (2006 – 2008)
24. Member, Faculty Recruiting Committee, CNSE (2006 – 2009)

University of Wisconsin

1. Associate Chair, Department of Materials Science and Engineering (1998 – 2000)
2. Admissions Committee, Materials Science Program
   - Member (1989 – 1995)
   - Chair (1990 – 1992)
3. Qualifying Examination Committee, Materials Science Program
   - Member (1993 – 1996)
   - Chair (1995 – 1996)
4. Chair, Wendt Engineering Library Faculty Oversight Committee (1998 – 1999)

External and professional service

1. Member, *MRS Bulletin* Book Review Committee, Materials Research Society (2011-2014)
2. Review panel member, Proliferation Deterrence Merit Review Team Workshop, Savannah River National Laboratory (2007)
3. Peer Reviewer, National Science Foundation (Division of Materials Research) (2007)
4. Member, External Review Panel, Univ. New Hampshire Materials Science Program (2006)
5. Chair, America Institute of Physics *ad hoc* Review Committee, *Review of Scientific Instruments* (2004)
6. Panel Reviewer, National Science Foundation (Small Business Innovative Research) (2004)
7. Panel Reviewer, National Science Foundation (Small Business Innovative Research) (2017)
8. Panel Reviewer, National Science Foundation (Small Business Innovative Research) (2018)
9. Panel Reviewer, National Science Foundation (Small Business Innovative Research) (2019)
10. Panel Reviewer, National Science Foundation (Materials Research Instrumentation) (2019)
11. Panel Reviewer, National Science Foundation (Small Business Innovative Research) (2020)
12. Referee for numerous scientific journals, including *Applied Physics Letters, Environmental Science and Technology, Journal of Alloys and Compounds, Journal of Applied Crystallography, Journal of Applied Physics, Journal of Crystal Growth, Journal of Vacuum Science and Technology, Physica Status Solidi* and *Thin Solid Films,* among others