Academic Vita

Timothy S. Cale
timothy.cale@gmail.com

Degrees:

Ph.D.	(Ch.E.) University of Houston, 1980 (dissertation in heterogeneous catalysis)
B.S.	(Ch.E.) Arizona State University, 1976 (summa cum laude)

Academic Experience:

2010 – 2012	Adjunct Professor, Center for Solid State Science, Arizona State University
2007 – 2009	Research/Adjunct Professor, School of Materials, Arizona State University
2003 – 2008	Adjunct Professor, College of Nanoscale Science and Engineering, University at Albany
1998 – 2007	Professor of Chemical Engineering, Rensselaer Polytechnic Institute
2004 – 2005	Visiting Professor, Department of Chemical Engineering, Vanderbilt University
1998 – 2004	Director, Focus Center – New York, Rensselaer: Interconnections for Hyperintegration
1993 - 1995	Director, Center for Solid State Electronics Research, ASU
1991 - 1997	Professor of Engineering, ASU
1990 - 1992	Assistant Chair of Chemical Engineering, ASU
1986 - 1991	Associate Professor of Engineering, ASU
1981 – 1986	Assistant Professor of Engineering, ASU
1981	Post-Doctoral Fellow, University of Houston

Industrial Experience (Post B.S. This is the only part of this document to change. See bio for details.)**:**

1997 – present	Principal, Process Evolution, Ltd.
2011 – 2015	Advisor, CTO (2013-15), reNature Inc.
2008 – 2011	CTO, Ambature, LLC
1991 – 1997	Motorola (summers, sabbatical, assigned by ASU, as part of leadership exchange)
1986	Intel Corp., Process Engineer (summer)
1976	Monsanto Company, Process Engineer

Professional Activities:

Reviewer for: NSF, ACS-PRF, DOE, ASME, AVS, MRS, ECS, AIChE, Physical Reviews, Thin Solid Fims

Member of Blue Ribbon Panel for Selection of Inductees into the National Inventors Hall of Fame, in the area of Integrated Circuits, Oct. 3, 2008.

Member of Multiscale Modeling and Simulation Panel, held during the 2008 ANSYS International Conference, Aug. 27, 2008.

Executive Committee for "Advanced Metallization Conference", 1991-2008.

Member of the DFG Review Panel for the German Excellence Initiative in Materials Science & Engineering, June 21, 22, 2007.

Program Committee for the 2006 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD) 2006

Program Committee of the AVS Second International Conference on Materials and Interfaces, February 2000-2006

Executive Committee for Chemical Mechanical Planarization for Multilevel Interconnection Conference (CMP-MIC) 2005-7

Executive Committee for VLSI Multilevel Interconnection Conference (VMIC) 2004-8

Associate Editor, IEEE Transactions on Semiconductor Manufacturing, 2001 - 2007

Keynote "A Conformal Voxel Method for Consistent Extraction in Complex Grain Structure Level-Set Simulations", International Conference on Computational and Experimental Engineering and Sciences", Dec. 1-6, 2005, Chennai, India

Chair of the Fifth AVS International Conference on Microelectronics and Interfaces, held March 1-4, 2004, Santa Clara, CA

Editor for Thin Film Materials, Processes, and Reliability, G. S. Mathad, T. S. Cale, D. Collins, M. Engelhardt, F. Leverd, and H. S. Rathore, eds., ECS PV 2003-13, ECS, 2003
Editor for Advanced Metallization 2002 (AMC 2002), B.M. Melnick, T.S. Cale, S. Zaima, and T. Ohta, eds., MRS, 2003
Lecturer during the State-of-the-Art Short Course on Chemical Mechanical Planarization for ULSI Multilevel Interconnection, Feb. 23, 2004
Executive Committee for the conference, "International Symposium on Applied Plasma Science", Kobe Japan, September 2003
Program Committee for the 2003 International Conference on Simulation of Semiconductor Processes and Devices: SISPAD 2003, September 2003
Keynote "Simulation of Materials Processing on the Island, Grain and Reactor Scales", presented during Multiscale Materials Modelling, London, England, June 17-20, 2002
Program Co-Chair for the Advanced Metallization Conference 2002, October 1-3, 2002, San Diego, CA
Executive Committee for the conference, "International Symposium on Applied Plasma Science", Fairbanks, Alaska, July 2001
Guest editor of a special issue of ***Thin Solid Films***, "Process and Materials Modeling in IC Fabrication", April 2000
Guest editor for First AVS International Conference on Materials and Processing in Microelectronics, in ***J. Vac. Sci. Tech.*** **B 17(5),** 1999
Keynote presentation: "Opportunities for Materials Modeling in Microelectronics", presented during the Multiscale Materials Modeling Symposium of the 1999 Meeting of the International Union of Materials Research Societies, June 1999, Bejing, China
Co-Chair of First AVS International Conference on Materials and Processing in Microelectronics, held March, 1999
Instructor during Chemical Mechanical Polishing Workshop, held May 1998, San Diego, CA
Co-Chair of Symposium on Advanced Metalization in Microelectronics, held during the International Conference on Metallurgical Coatings and Thin Films, 1993-98
Member of the University Advisory Committee, Semiconductor Research Corporation, 1995-1997
Co-authored the winner of the Norman Hackerman Best Paper Award from the Electrochemical Society in 1994
Member of the US Delegation to the workshop "Korea-United States Design and Manufacturing", November, 17-19, 1993, Taejon, Korea
Editor for Advanced Metallization for ULSI Applications 1992, with F. Pintchovski, MRS, 1993.
Instructor for short course on Advanced Metalization, 1992 and 1993
Faculty Advisor (past) to: AIChE (1981-1988), Tau Beta Pi (1981-1992)
Program Co-Chair for the 1992 International Workshop on Advanced Metalization for ULSI Applications, held October 19-22, 1992
Organizer for "Technology Transfer Conference on EVOLVE", held 1992, 1994 and 1997, sponsored by the Semiconductor Research Corporation
Chair of numerous sessions on transport and reaction in microelectronics for AIChE, AVS, MRS and ECS

Research Interests:
Advanced materials processing and applications fundamentals; grain-focused experimental and theoretical materials research; experimental and theoretical studies on thin film processing; reaction engineering; applied mathematics

Teaching Interests:
Advanced materials processing and applications, reaction engineering, applied mathematics, thermodynamics

Selected External Grants and Contracts:

Interconnect Focus Center: Interconnections for Hyperintegration", MARCO/DARPA and NYSTAR, PI with 7 others at RPI, 2006-2009, $2.95 M per year.

"Predictive Modeling and Simulation", Interconnect Focus Center: Interconnections for Hyperintegration", MARCO/DARPA and NYSTAR, 2007, $325,000.

“Interconnect Focus Center: Interconnections for Hyperintegration”, MARCO/DARPA and NYSTAR, PI with 3 Co-PIs at RPI, 2003-2006, $2.95 M per year.

“Predictive Modeling and Simulation”, Interconnect Focus Center: Interconnections for Hyperintegration”, MARCO/DARPA and NYSTAR, 2006, $620,000.

“Predictive Modeling and Simulation”, Interconnect Focus Center: Interconnections for Hyperintegration”, MARCO/DARPA and NYSTAR, 2005, $560,000.

“Predictive Modeling and Simulation”, Interconnect Focus Center: Interconnections for Hyperintegration”, MARCO/DARPA and NYSTAR, 2004, $970,000.

“Interconnect Focus Center: Interconnections for Gigascale Integration”, MARCO/DARPA and NYSTAR, Project Director, PI with 4 Co-PIs at RPI, 2003, $3.25 M per year.

“Microstructure Evolution and Multiscale Modeling”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 2003, $460 K per year.

“Magnetic Alignment of Substrates”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 2003, $270 K per year.

“Interconnect Focus Center: Interconnections for Gigascale Integration”, MARCO/DARPA and NYSSTF, Project Director, PI with 5 Co-PIs at RPI, 2002, $3.43 M per year.

“Microstructure Evolution and Multiscale Modeling”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 2002, $590 K per year.

“Magnetic Alignment of Substrates”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 2002, $299 K per year.

“Interconnect Focus Center: Interconnections for Gigascale Integration”, MARCO/DARPA and NYSSTF, Project Director, PI with 6 Co-PIs at RPI, 2000/01, $3.29 M per year.

“Microstructure Evolution and Multiscale Modeling”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 2001, $590,000 per year.

“Modeling Polycrystalline Film Processing and Evolution”, IBM, $208,000, 1999. (D. F. Richards is Co-PI.)

“Interconnect Focus Center: Interconnections for Gigascale Integration”, MARCO/DARPA and NYSSTF, Project Director, PI with 16 Co-PIs at RPI, 1998 – 2000, $3.15 M per year.

“Microstructure Evolution and Multiscale Modeling”, Interconnect Focus Center: Interconnections for Gigascale Integration, MARCO/DARPA and NYSSTF, 1998-2000, $325,000 per year.

"Using Topography and Composition to Establish Kinetic and Transport Models", Semiconductor Research Corporation", 7/97-9/98, $50,000.

"Using Topography and Composition to Establish Kinetic and Transport Models", Semiconductor Research Corporation", 7/96-6/97, $50,000.

“Design Methodologies for Reactive Processes”, Semiconductor Research Corporation”, 4/96-7/97, $240,000. (G. B. Raupp is Co-P.I.)

“Precursor Evaluation for Aluminum CVD”, Materials Research Corp., 1/96-7/97, $75,000.

“Rotating Disk Reactor for Aluminum CVD”, Materials Research Corp., 3/96-3/99, $230,000.

“Graduate Research Traineeships”, NSF, 6/95-6/98, $500,000. (V. A. Burrows is P.I.).

"Silicon-Based Nanostructures: Experiment and Modeling", ONR, 6/95-5/98, $3.7 M. (Co-P.I. with D. Ferry and four others)

"Using Topography and Composition to Establish Kinetic and Transport Models", Semiconductor Research Corporation", 7/95-6/96, $50,000.

"Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation, 1/95-3/96, $175,000. (G. B. Raupp is Co-P.I.)

"Development and Validation of Etch Process Simulator", Motorola, 5/94-5/95, $74,500.

"Development of an Aluminum CVD Process", Materials Research Corporation, 1/94-12/95, $89,000.

"Using Films Deposited in Features to Establish Kinetic and Transport Models", NSF, 2/94-12/98, $214,000. (G. B. Raupp is Co-P.I.)

"Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation, 1/94-12/94, $140,000. (G. B. Raupp is Co-P.I.)

"Single Wafer Plasma Reactor Simulator", AFOSR (AASERT), 3/94-3/97, $89,000.

"Technology Transfer of EVOLVE", Semiconductor Research Corporation, 8/93-7/94, $115,000.

"Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation, 1/93-12/93, $140,000. (G. B. Raupp is Co-P.I.)

Equipment Donation; Spectrum 202 LPCVD Reactor System, Motorola, Inc., $90,000. (G. B. Raupp is Co-P.I.)

Equipment Donation; Spectrum 202 Reactors", Materials Research Corp., Inc., $560,000. (G. B. Raupp is Co-P.I.)

"Mathematical Modeling for Simulation and Control of Semiconductor Processes", DARPA, 10/92-9/95, $693,000. (Co-P.I. with P. Crouch).

"Interdisciplinary Undergraduate Program in Materials Science and Processing", NSF, 10/1/92-9/30/95, $350,000. (Jim Mayer P.I., 14 others and myself contributing)

"Heteroepitaxy of Ternary SiGeC", AFOSR, 4/1/93-3/31/96, $1,508,000. (Jim Mayer is P.I., 9 others and myself contributing)

"Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation, 1/92-12/92, $140,000. (G. B. Raupp is Co-P.I.)

"Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation, 1/91-12/91, $105,000. (Co-P.I. with G. B. Raupp)

"Programmed Rate Chemical Vapor Deposition", NSF, 3/90-3/94, $255,059. (G. B. Raupp is Co-P.I.)

"Process Development Tools for Single Wafer LPCVD Reactors: Step Coverage Prediction", Semiconductor Research Corporation, 1/90-12/90, $95,503. (Co-P.I. with G. B. Raupp)

"Equipment: Process Development Tools for Single Wafer LPCVD Reactors: Step Coverage Prediction", Semiconductor Research Corporation, 1/90-12/90, $20,500. (Co-P.I. with G. B. Raupp)

"Measurement of Axial Catalyst Temperature Profiles", NSF, 1987-90, $112,270.

"Low Reynolds Number Transport in Packed Beds", ACS-PRF(AC), 1985-87, $35,000.

"Desiccant Materials Assessment and Development", Gas Research Institute, 1985-86, $74,100. (I. Zwiebel was Co-P.I.)

"Magnetochemistry of Adsorbates and Catalysts", Council for Chemical Research, 1984, $5,000.

"Magnetic Crystallite Thermometry", ACS-PRF(G), 1983-85, $15,000.

"Magnetic Crystallite Thermometry", NSF Initiation, 1983-85, $52,400.

"SHE Superconducting Magnet - Magnetometer", NSF Equipment, 1983-85, $150,600. (Co-P.I. with W. S. Glaunsinger)

Publications:

345. (invited) “Three-Dimensional Integration in Microelectronics: Motivation, Processing and Thermomechanical Modeling”, Timothy S. Cale, Jian-Qiang Lu, and Ronald J. Gutmann, ***Chem. Eng. Comm.*** **195,** 847-88 (2008).

344. "A Study on Wafer-Level 3D Integration Including Wafer Bonding using Low-k Polymeric Adhesive", Yongchai Kwon, Jongwon Seok, Jian-Qiang Lu, Timothy Cale and Ronald Gutmann, ***Korean Chemical Engineering Research*** **45(5)**, 466-72 (2007). (In Korean.)

343. "Diameter distribution of thermally evaporated indium metal islands on silicon substrates", Joleyn Balch, Loucas Tsakalakos, William Huber, James Grande, Michael Knussman, and Timothy S. Cale, in Nanomaterials Synthesis, Interfacing, and Integrating in Devices, Circuits, and Systems II, N.K. Dhar, A.K. Dutta, M.S. Islam, Editors, Proc. SPIE Vol. 6768, SPIE, 2007, paper 67680A, pp. 1-12

342. (invited) "Rensselaer 3D Integration Processes", J.-Q. Lu, T.S. Cale and R.J. Gutmann, Section IV.H, in Handbook of 3D Integration: Technology and Applications of 3D Integrated Circuits, P. Garrou, C. Bower, and P. Ramm, editors, Wiley, 2008.

341. (invited) "Polymer Adhesive Bonding Technology", J.-Q. Lu, T.S. Cale and R.J. Gutmann, Section III.C.4, in Handbook of 3D Integration: Technology and Applications of 3D Integrated Circuits, P. Garrou, C. Bower, and P. Ramm, editors, Wiley, 2008.

340. (invited) "3D Integration Based upon Dielectric Adhesive Bonding" J.-Q. Lu, T.S. Cale and R.J. Gutmann, Chapter 11 in Wafer-Level 3-D ICs Process Technology, C.S. Tan, R.J. Gutmann, and L.R. Reif, editors, Springer, 2008.

339. "Evaluation of BCB-Bonded and Thinned Wafer Stacks for Three Dimensional (3D) Integration", Yongchai Kwon, Anurag Jindal, Rod Augur, Jongwon Seok, Timothy S. Cale, Ronald J. Gutmann, and Jian-Qiang Lu, ***J. Electrochem. Soc*.** **155(5)**, H280-H286 (2008).

338. "Strain Energy Driven and Curvature Driven Grain Boundary Migration in 3D-IC Cu Vias", C.A. Awo-Affouda, M.O. Bloomfield, T.S. Cale, in 2007 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD), IEEE, 2007, pp. 41-44.

337. (invited chapter) "Grain Continuum Modelling of Material Behaviour", M.O. Bloomfield and T.S. Cale, in Multiscale Materials Modeling in Structural Engineering, Z.X. Guo, ed., Woodhead Publishing, 2007, pp. 148-188.

336. "Modeling Multiscale Effects of Transients During Chemical Vapor Deposition", M.K. Gobbert and T.S. Cale, ***Surface and Coatings Technology*** **201(22-23)**, 8830-37 (2007).

335. "Two Deterministic Approaches to Topography Evolution", M.O. Bloomfield, M.K. Gobbert and T.S. Cale, ***Surface and Coatings Technology*** **201(22-23)**, 8873-77 (2007).

334. "Thermally Induced Stresses in 3D-IC Inter-wafer Interconnects: A Combined Grain-Continuum and Continuum Approach", M.O. Bloomfield, D.N. Bentz, J.-Q. Lu, R.J. Gutmann and T.S. Cale, ***Microelect. Eng.*** **84**, 2750-56 (2007).

333. "Hybrid Grain-Continuum Model for Thermo-Mechanical Stresses in Polycrystalline Cu 3D IC Vias", M.O. Bloomfield, D. N. Bentz, V. Sukarev, T. S. Cale, in 2007 IEEE International Reliability Physics Symposium Proceedings, IEEE, 2007, pp. 644-5.

332. "Fine Keyed Alignment and Bonding for Wafer-Level 3D ICs", S.H. Lee, F. Niklaus, J.J. McMahon, J. Yu, R.J. Kumar, H.-F. Li, R.J. Gutmann, T.S. Cale, J.-Q. Lu, in Materials, Technology and Reliability of Low-k Dielectrics and Copper Interconnects, T.Y. Tsui, Y-C. Joo, A.A. Volinsky, M. Lane, L. Michaelson (eds.), MRS Symp. Proc. Vol. 914, 2006, paper 0914-F10-05: 1-6.

331. "Stress-Induced Grain Boundary Migration in Polycrystalline Copper," Max O. Bloomfield, Daniel .N. Bentz, and Timothy S. Cale, ***Journal of Electronic Materials*** **37**, 249-63 (2008).

330. "Applying Grain Continuum Models to Stress-Induced Grain Evolution in Next Generation Integrated Circuit Interconnects," D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann and T.S. Cale, in Comsol Users Conference Proceedings, J. Hiller (ed.), Comsol, 2006, pp. 309-17.

329. "Stress Induced Migration in Polycrystalline Films: a Time-Scale Analysis," M.O. Bloomfield, D.N. Bentz, J.-Q. Lu, R.J. Gutmann, and T. S. Cale, in 2006 Proceedings of the Twenty Third International VLSI Multilevel Interconnection Conference (VMIC), T. Wade (ed.), IMIC, 2006, pp. 234-39.

328. "Critical Adhesion Energy at the Interface between Benzocyclobutene and Silicon Nitride Layers", Yongchai Kwon, Jongwon Seok, Jian-Qiang Lu, Timothy S. Cale, and Ronald J. Gutmann, ***J. Electrochem. Soc.*** 154(6), H460-H465 (2007).

327. "Mechanical Models of Polycrystalline 3D-IC Interwafer Vias," D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, in Advanced Metallization Conference 2006 (AMC 2006), S.W. Russell, M.E. Mills, A. Osaki, and T. Yoda, editors, MRS, Warrendale, PA, 2007, pp. 275-80.

326. "Stress Induced Grain Boundary Migration in Polycrystalline Cu Lines," D.N. Bentz, M.O. Bloomfield, J.-Q Lu, R.J. Gutmann, and T.S. Cale, in Proceedings of International Conference on Multiscale Materials Modeling (MMM), P. Gumsch (ed.), Fraunhofer IRB Verlag, 2006, pp. 404-7.

325. "Grain Based Modeling of Stress-Induced Copper Migration for 3D-IC Interwafer Vias," D.N. Bentz, M.O. Bloomfield, H. Huang, J.-Q Lu, R. J. Gutmann, and T.S. Cale, in 2006 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2006), IEEE, 2006, pp. 345-48.

324. "Influences of Grain Structure on Thermally Induced Stresses in 3D IC Inter-wafer Vias," D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, ***Journal of Computational Electronics*** **5(4)**, 327-31 (2006).

323. "Grain-focused Microstructure Simulations: Stress-Induced Evolution of Polycrystalline Films," D.N. Bentz, M.O. Bloomfield, and T.S. Cale, in 11th International Ceramics Congress Advances in Science and Technology, Trans Tech Pub., 2006, pp. 1178-83.

322. "Effect of the Knudsen Number on Transient Times During Chemical Vapor Deposition", Matthias K. Gobbert and Timothy S. Cale, ***Int. J. Multiscale Comp. Eng.*** **4(3)**, 319-35 (2006).

321. "Atomistic Modeling of Electron Transport in Self-Assembled Arene-Based Molecular Wires", X-Y, Liu, J.E. Raynolds, C. Wells, J. Welch, and T.S. Cale, in 2005 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2005), IEEE, 2005, pp. 271-74.

320. "Three-dimensional Ehrlich-Schwoebel Barriers for W", Z. Xu, L. G. Zhou, J. Wang, T. S. Cale, H. Huang, ***Computers, Materials & Continua*** **5(1)**, 43-47 (2006).

319. "Modeling Thermal Stresses of Copper Interconnects in 3D IC Structures", Daniel N. Bentz, Jing Zhang, Max Bloomfield, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, in Proceeding of the COMSOL Multiphysics Conference 2005, J. Hiller (ed.), COMSOL, 2005, pp. 321-26.

318. "Thermally Induced Stresses in 3D ICs", Max Bloomfield, Jing Zhang, Daniel N. Bentz, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, in Advanced Metallization Conference (2005), MRS, 2006, pp. 649-54.

317. "Molecular Caulk: Enabling aspects for ultar-low κ dielectric integration", Jay J. Senkevich, Brad P. Carrow, Benjamin W. Woods, Dae-lok Bae, Timothy S. Cale and Pei-I Wang, in Advanced Metallization Conference (2005), MRS, 2006, pp. 375-79.

316. (invited) "Thermal Stresses in 3D IC Interwafer Vias", Daniel N. Bentz, Jing Zhang, Max O. Bloomfield, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, in Proceedings of the Twenty Second International VLSI Multilevel Interconnect Conference (VMIC), T. Wade (ed.), IMIC, 2005, pp. 89-96.

315. (invited) "Wafer-Level 3D Integration Technology Platforms for ICs and MEMs", F. Niklaus, J.-Q. Lu, J. J. McMahon, J. Yu, S. H. Lee, T. S. Cale, R. J. Gutmann, , in Proceedings of the Twenty Second International VLSI Multilevel Interconnect Conference (VMIC), T. Wade (ed.), IMIC, 2005, pp. 486-93.

314. "Adhesive Wafer Bonding using Partially Cured Benzocyclobutene (BCB) for 3D Integration", F. Niklaus, R.J. Kumar, J.J. McMahon, J. Yu, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, ***J. Electrochem. Soc.*** **153(4)**, G291-G295 (2006).

313. "Critical Adhesion Energy of Benzocyclobutene (BCB)-Bonded Wafers", Yongchai Kwon, Jongwon Seok, Jian-Qiang Lu, Timothy S. Cale, and Ronald J. Gutmann, ***J. Electrochem. Soc.*** **153(4)**, G237-G252 (2006).

312. “A Kinetic Transport and Reaction Model and Simulator for Rarefied Gas Flow in the Transition Regime”, Matthias K. Gobbert and Timothy S. Cale, ***J. Comp. Phys.*** **213**, 591-612 (2006).

311. “A Galerkin Method for the Simulation of the Transient 2-D/2-D and 3-D/3-D Linear Boltzmann Equation”, Matthias K. Gobbert, Samuel G. Webster, and Timothy S. Cale, ***J. Sci. Comp.***, (published on-line Feb. 17, 2006); **30(2)**, 237-73 (2007).

310. “Modeling Thermal Stresses in 3D IC Inter-Wafer Interconnects”, Jing Zhang, Max O. Bloomfield, Jian-Qiang Lu, Ronald Gutmann, and Timothy S. Cale, ***IEEE Trans. Semi. Manuf.*** **19(4)**, 437-48 (2006).

309. “Metallization of Sealed Porous MSQ”, Timothy S. Cale, Dae-lok Bae, Christopher Jezewski and Jay J. Senkevich, in Silicon Nitride and Silicon Dioxide Thin Insulating Films and Other Emerging Dielectrics VIII, R. E. Sah, M. J. Deen, J. Zhang, J. Yota, and Y. Kamakura, eds., Proc. Vol. 2005-01, ECS, 2005, pp. 521-34.

308. “Thermal Stresses in 3D IC Inter-wafer Interconnects”, Jing Zhang, Max O. Bloomfield, Jian-Qiang Lu, Ronald J. Gutmann, and Timothy S. Cale, ***Micro. Eng. 82***, 534-47 (2005).

307. “Effects of Bonding Process Parameters on Wafer-to-Wafer Alignment Accuracy in Benzocyclobutene (BCB) Dielectric Wafer Bonding”, Frank Niklaus, R. J. Kumar, J. J. McMahon, J. Yu, T. Matthias, M. Wimplinger, P. Lindner, J. -Q. Lu, T. S. Cale and R. J. Gutmann, in Materials, Technology and Reliability of Advanced Interconnects – 2005 Symposium, MRS Symp. Proc. Vol. 863, MRS, 2005, pp. 393-98.

306. “Cluster Computing for Transient Simulations of the Linear Boltzmann Equation on Irregular Three-Dimensional Domains”, Matthias K. Gobbert, Mark L. Breitenbach and Timothy S. Cale, in Lecture Notes in Computer Science Vol. 3516, Vaidy S. Sunderam, Geert Dick van Albada, Peter M. A. Sloot, and Jack J. Dongarra, eds., Springer-Verlag, 2005, pp. 41-48.

305. “The Use of Conformal Voxels for Consistent Extractions from Multiple Level-Set Fields”, Max O. Bloomfield, David F. Richards, and Timothy S. Cale, in Lecture Notes in Computer Science Vol. 3516, Vaidy S. Sunderam, Geert Dick van Albada, Peter M. A. Sloot, and Jack J. Dongarra, eds., Springer-Verlag, 2005, pp. 49 -56.

304. “First-Principles Modeling of Electronic Transport in π-Stacked Molecular Junctions”, X.-Y. Liu, J. E. Raynolds, C. Wells, J. Welch, and T. S. Cale, ***J. Appl. Phys. 98***, paper 033712: 1-4 (2005); also in ***Virtual Journal of Nanoscale Science and Technology 12(8)*** (2005).

303. “Study of the Step Coverage by Using Evolve Simulation Program and Comparison of the Contact Resistance values for different Contact Openings by Using Two-Step and One-Step Titanium Nitride Barrier Process”, Ardy Sidhwa, Chuck Spinner, Todd Gandy, Mike Goulding, William Brown, Hameed Naseem, Richard Ulrich, Simon Ang, Late Sherwood Charlton, Vinay Prasad and Timothy Cale, ***IEEE Trans. Semi. Manuf.*** **18(1)**, 163-73 (2005).

302. “Effects of Substrate/Film Temperature on Properties of Reactively Sputtered Tantalum Oxide Films”, Pushkar Jain, Jasbir S. Juneja, Vinay Bhagwat, Eugene J. Rymaszewski, Toh -Ming Lu, and Timothy S. Cale, ***J. Vac. Sci. Tech. A*** **23(3)**, 512-19 (2005).

301. “Material removal model of chemical-mechanical polishing considering wafer flexibility and edge effects”, Jongwon Seok, Cyriaque P. Sukam, Andrew T. Kim, John A. Tichy, Timothy S. Cale, ***Wear*** **257(5-6)**, 496-508 (2004).

300. “Simulation of Microstructure Formation during Thin Film Deposition”, Max O. Bloomfield and Timothy S. Cale, in Simulation of Semiconductor Processes and Devices 2004, G. Wachutka and G. Schrag, eds., Springer Verlag 2004, pp. 232-6.

299. “Elastic Properties of Nanoplates: Electronic and Atomic Factors”, L. G. Zhou, H. W. Shim, H. Huang and T. S. Cale, in Proceedings of the Second International Conference on Multiscale Materials Modeling, Nasr M. Ghoniem (ed.), UCLA, 2004, pp. 582-84.

298. (invited) “Multiscale Transport and Thin Film Microstructure Development”, M. O. Bloomfield, T. S. Cale and H. Huang, in Proceedings of the Second International Conference on Multiscale Materials Modeling, Nasr M. Ghoniem (ed.), UCLA, 2004, p. 577-79.

297. "Multiscale Modeling for Interconnects – A Grain Focus", Timothy S. Cale, Max O. Bloomfield and Hanchen Huang, submitted to ECS, PV series.

296. "Applications of Plasma Coatings in Artificial Joints: An Overview", H. Liang, Bing Shi, Aaron Fairchild and Timothy Cale, ***Vacuum 73***, 317-26 (2004).

295. "Multiscale Modeling for Interconnects: Status and Opportunities", Timothy S. Cale, Max O. Bloomfield, Xiang-Yang Liu and Hanchen Huang, James E. Raynolds, Christopher Wells, John T. Welch, and Alain E. Kaloyeros, 2004 Proceedings of the 21st International VLSI Multilevel Interconnection Conference (VMIC), T. Wade, ed., IMIC, 2004, pp. 343-50.

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16. "Composition Variation between Cu-Ni Crystallites using TEM and EDX", P. K. Sinha and T. S. Cale, in Microstructure and Properties of Catalysts, M. M. J. Treacy, J. M. Thomas and J. M. White, eds., MRS Symp. Ser., Vol. 111, 1988, pp. 191-94.

15. "Effectiveness Factors for Single Pellets during Ethane Hydrogenolysis", T. S. Cale, ***Chem. Eng. Comm.*** **70**, 57-65 (1988).

14. "Low Re Interphase Nu for Axial Dispersion and Bypassing Reactor Models", T. S. Cale, J. M. Lawson and D. K. Ludlow, ***Chem. Eng. Commun***. **56(1-6**), 169-81 (1987).

13. "Linear Programming", T. S. Cale, in AICHE CHEMI Modular Instructional Series of CACHE, Module G3.5, in Series G: Design of Equipment, Volume 3: Process Operations, J. Beckman, ed., AIChE, 1987, pp. 38-44.

12. "Nickel Crystallite Thermometry during Methanation", D. K. Ludlow and T. S. Cale, ***ACS Div. Fuel Chem.*** **31(3)**, 32-40 (1986).

11. "Interpretation of Hydrogen Chemisorption on Nickel Catalysts", J. T. Richardson and T. S. Cale, ***J. Catal.*** **102(2)**, 419-32 (1986).

10. Book Review of Heterogeneous Reactor Design (by Hong H. Lee), T. S. Cale, ***A.I.Ch.E. J.*** **32(4)**, 701 (1986).

9. "Application of Catalytic Crystallite Thermometry to Interphase Transport Studies", T. S. Cale and J. M. Lawson, ***Chem. Eng. Comm.*** **39(1-6)**, 241-45 (1985).

8. "Cyclopropane Hydrogenolysis Reactions over Ni-Cu/SiO_2 Catalysts", T. S. Cale and J. T. Richardson, ***J. Cat.*** **94(1)**, 289-91 (1985).

7. "Interphase Heat Transfer in Packed Beds", J. M. Lawson, D. K. Ludlow and T. S. Cale, in Proceedings of the IASTED International Conference: Applied Identification, Modeling, and Simulation, AIMS '84, M. H. Hamza, ed., ACTA Press, 1985, pp. 26-31.

6. "Nickel Crystallite Thermometry During Ethane Hydrogenolysis", T. S. Cale, ***J. Cat.*** **90(1),** 40-48 (1984).

5. "Application of AC Permeametry to Catalytic Crystallite Thermometry", D. K. Ludlow and T. S. Cale, ***Anal. Inst.*** **13(2)**, 183-92 (1984).

4. "Magnetic Crystallite Thermometry", D. K. Ludlow and T. S. Cale, ***J. Cat.*** **86(2)**, 450-53 (1984).

3. "*In-Situ* Characterization of Ni-Cu/$Si0_2$ Catalysts", T. S. Cale and J. T. Richardson, ***J. Cat.*** **79(2)**, 378-89 (1983).
2. "Size Effect on the Magnetic Moment Density of Dispersed Nickel", T. S. Cale, J. T. Richardson and J. J. Ginestra, ***Appl. Phy. Lett.*** **42(8)**, 744-46 (1983).
1. "Crystallite Size Distributions and Stabilities of Homogeneously Deposited Ni/SiO_2 Catalysts", J. T. Richardson, R. J. Dubus, J. G. Crump, P. Desai, U. Osterwalder and T. S. Cale, in Preparation of Catalysts II, Scientific Bases for the Preparation of Heterogeneous Catalysts, B. Delmon, P. Grange, P. Jacobs and G. Poncelet, eds., Elsevier Scientific Publishing Company, 1978, pp. 131-42.

Selected Presentations: (since 1990)

(invited) “A Framework for Simulating Grain Evolution”, Timothy S. Cale, presented during the ARO Workshop “Atomistic Interfaces 2009”, held at the Univ. of Connecticutt, August 24-26, 2009.

“Strain Energy Driven and Curvature Driven Grain Boundary Migration in 3D-IC Cu Vias”, C.A. Awo-Affouda, M.O. Bloomfield, T.S. Cale, presented during 2007 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD), Vienna, Austria, Sept. 25-27, 2007.

(invited) “Modeling Multiscale Effects of Transients During Chemical Vapor Deposition”, presented during EuroCVD 16, Den Haag, The Netherlands, Sept. 16-21, 2007.

“Two Deterministic Approaches to Topography Evolution”, M.O. Bloomfield, M.K. Gobbert and T.S. Cale, presented during EuroCVD 16, Den Haag, The Netherlands, Sept. 16-21, 2007

“Diameter distribution of thermally evaporated indium metal islands on silicon substrates”, Joleyn Balch, Loucas Tsakalakos, William Huber, James Grande, Michael Knussman, and Timothy S. Cale, presented during SPIE Optics East, Boston, MA, Sept. 9-12, 2007.

(invited) “Microstructure-Based Compact Model for Stresses in 3D-IC Interwafer Vias”, Awo-Affouda, Max O. Bloomfield, and Timothy S. Cale, presented during the US National Congress on Computational Mechanics, San Francisco, CA, July 23-26, 2007.

“Stress Induced Grain Structure Evolution in Copper Interconnects”, Max O. Bloomfield, Daniel N. Bentz, and Timothy S. Cale, presented during the 2007 Spring MRS Meeting, San Francisco, CA, April 9-13, 2007.

“Grain-Focused Modeling and Simulation”, Daniel N. Bentz, Max O. Bloomfield, and Timothy S. Cale, presented during the Nano and Giga Challenges in Electronics and Photonics: From Atoms to Materials to Devices to System Architecture”, Phonix, AZ, March 12-16, 2007.

(Invited) "Virtual Processing on Nanostructured Materials", M. O. Bloomfield and T. S. Cale, Arizona's Second Annual Nanotechnology Symposium, Scottsdale, AZ, March 23, 2007.

“Stress Induced Grain Evolution in 3D-IC Inter-Wafer Interconnects, M. O. Bloomfield, D. N. Bentz, T. S. Cale, Materials for Advanced Metallization, Bruges, Belgium, March 4-7, 2007.

“Applying Grain Continuum Models to Stress Induced Grain Evolution in Next Generation Integrated Circuit Interconnects,” D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann and T.S. Cale, COMSOL User Conference 2006 Boston, Boston, MA, October 22-24, 2006.

“Mechanical Models and Evolution of Polycrystalline 3D-IC Interwafer Vias,” D.N. Bentz, M.O. Bloomfield, J.-Q Lu, R.J. Gutmann, and T.S. Cale, Advanced Metallization Conference (AMC) 2006, San Diego, CA, October 17-19, 2006.

“Stress-Induced Grain Evolution for 3D IC Reliability,” M.O. Bloomfield, D.N. Bentz, J.-Q Lu, R. J. Gutmann, and T.S. Cale, Twenty Third International VLSI Multilevel Interconnection Conference, Fremont CA, September 25-28, 2006.

“Stress Induced Grain Boundary Migration in Polycrystalline Via Structures,” D.N. Bentz, M.O. Bloomfield, J.-Q Lu, R. J. Gutmann, and T.S. Cale, Multiscale Materials Modeling Third International Conference, Freiburg, Germany September 18-22, 2006.

“Grain Based Modeling of Stress Induced Cooper Migration for 3D-IC Interwafer Vias,” D.N. Bentz, M.O. Bloomfield, H. Huang, J.-Q Lu, R.J. Gutmann, and T.S. Cale, The 2006 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD '06), Monterey, CA, September 6-8, 2006.

“Stress-Induced Grain Boundary Migration In Polycrystalline Films,” D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, 7th World Congress on Computational Mechanics, Los Angeles, CA, July 16-22, 2006.

“Next-Generation IC Interconnect Modeling using a Grain Continuum Approach,” D.N. Bentz, M.O. Bloomfield, and T.S. Cale, Comsol Reaction Engineering Workshop, Troy, NY, June 27, 2006.

“Grain-focused Microstructure Simulations: Stress-Induced Evolution of Polycrystalline Films,” D.N. Bentz, M.O. Bloomfield, and T.S. Cale, 11th International Conferences on Modern Materials and Technologies, Acireale, Sicily, Italy, June 4-9, 2006.

“Influences of Grain Structure on Thermally Induced Stresses in 3D IC Inter-wafer Vias,” D.N. Bentz, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, 11th International Workshop on Computational Electronics, Vienna, Austria, May 25-27, 2006.

"Fine Keyed Alignment and Bonding for Wafer-Level 3D ICs”, S.H. Lee, F. Niklaus, J.J. McMahon, J. Yu, R.J. Kumar, H.-F. Li, R.J. Gutmann, T.S. Cale, J.-Q. Lu, MRS Spring Meeting Paper F10.5, April 21, 2006, San Francisco, CA.

“Introducing Grain Structure Into Thermo-Mechanical Models of 3D-IC Inter-wafer Vias,” D.N. Bentz, M.O. Bloomfield, J.-Q Lu, R. J. Gutmann, and T.S. Cale, 7th International Conference on Microelectronics and Interfaces (ICMI'06), Austin, TX, March 6-8, 2006.

(keynote) “A Conformal Voxel Method for Consistent Extraction in Complex Grain Structure Level-Set Simulations”, Max O. Bloomfield, David F. Richards and Timothy S. Cale, International Conference on Computational and Experimental Engineering and Sciences”, Dec. 1-6, 2005, Chennai, India.

“Consistent Extraction of Multiple Level Sets Using the Conformal Voxels Method”, Max Bloomfield and Timothy S. Cale, AIChE Meeting, Oct. 31 – Nov. 4, 2005, Cincinnati, OH.

“Grain Focused Simulation of Zirconia Cvd”, Max Bloomfield, Zhe Song, Bridget R. Rogers, and Timothy S. Cale, AIChE Meeting, Oct. 31 – Nov. 4, 2005, Cincinnati, OH.

“Modeling Thermal Stresses of Copper Interconnects in 3D IC Structures”, Daniel N. Bentz, Jing Zhang, Max Bloomfield, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, FEMLAB Conference 2005, Oct. 23-25, 2005, Boston, MA.

“Thermal Stresses in 3D IC Interwafer Vias”, Daniel N. Bentz, Jing Zhang, Max O. Bloomfield, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, Twenty-Second International VLSI Multilevel Interconnection Conference (VMIC), Oct. 4-6, 2005, Fremont, CA.

“Thermally Induced Stresses in 3D ICs”, Max Bloomfield, Jing Zhang, Daniel N. Bentz, Jian-Qiang Lu, Ronald J. Gutmann and Timothy S. Cale, Advanced Metallization Conference (2005), Sept. 27-29, 2005, Colorado Springs, CO.

“Molecular Caulk: Enabling aspects for ultar-low κ dielectric integration”, Jay J. Senkevich, Brad P. Carrow, Benjamin W. Woods, Dae-lok Bae, Timothy S. Cale and Pei-I Wang, Advanced Metallization Conference (2005), Sept. 27-29, 2005, Colorado Springs, CO.

“Grain-Focused Simulation of Zirconia CVD”, Max. O. Bloomfield, Zhe Song, Bridget R. Rogers, Timothy S. Cale, 6th Pacific Rim Conference on Ceramic and Glass Technology, Sept. 12-16, 2005, Maui, Hawaii.

(invited) “There and Back Again: Managing Discrete-to-Continuum-to-Discrete Transitions”, M. O. Bloomfield, H. Huang and T. S. Cale, European Conference on Materials (EuroMat 2005), September 5-9, 2005, Prague, CZ.

“Atomistic Modeling of Electron Transport in Self-Assembled Arene-Based Molecular Wires”, X-Y, Liu, J.E. Raynolds, C. Wells, J. Welch, and T.S. Cale, 2005 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2005), September 1-3, 2005, Tokyo Japan.

“Cluster Computing for Transient Simulations of the Linear Boltzmann Equation on Irregular Three-Dimensional Domains”, Matthias K. Gobbert, Mark L. Breitenbach and Timothy S. Cale, International Conference on Computational Science, May 22-25, 2005, Atlanta, GA.

“The Use of Conformal Voxels for Consistent Extractions from Multiple Level-Set Fields”, Max O. Bloomfield, David F. Richards, and Timothy S. Cale, Second International Workshop on Simulation of Muliphysics Multiscale Systems and International Conference on Computational Science, May 22-25, 2005, Atlanta, GA.

“A Cross-linkable Poly(p-xylylene) Derivative to Protect Ultra-Low κ Dielectrics”, Brad P Carrow, Jay J. Senkevich, Toh-Ming Lu, Timothy S. Cale, Yunqing Chen, and Hassaram Bakhru, Presentation B2.10, Spring 2005 Materials Research Society meeting, April 28 – May 1, 2005, San Francisco, CA.

“Effects of Bonding Process Parameters on Wafer-to-Wafer Alignment Accuracy in Benzocyclobutene (BCB) Dielectric Wafer Bonding”, Frank Niklaus, R. J. Kumar, J. J. McMahon, J. Yu, T. Matthias, M. Wimplinger, P. Lindner, J. -Q. Lu, T. S. Cale and R. J. Gutmann, Presentation B10.8, Spring 2005 Materials Research Society meeting, April 28 – May1, 2005, San Francisco, CA.

“Thermal Stress in 3D IC Interwafer Interconnects”, J. Zhang, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, MAM2005 - Materials for Advanced Metallization Conference 2005, March 6 - 9, 2005, Dresden, Germany.

“A Finite Element Study of Thermal Stress in 3D IC Structures”, J. Zhang, M.O. Bloomfield, J.-Q. Lu, R.J. Gutmann, and T.S. Cale, AVS 6th International Conference on Microelectronics and Interfaces (ICMI'05), March 21 - 23, 2005, Santa Clara, CA

“Diffusion Barriers and Nanostructure Design”, J. Wang, H. Huang, and T. S. Cale, Presentation U5.11, Fall 2004 Meeting of the Materials Research Society, Nov. 29 – Dec. 3, 2004, Boston, MA.

“Atomistic Electron Transport Modeling of π-Stacked Molecular Interconnects”, X.-Y. Liu, J.E. Raynolds, C. Wells, J. Welch, and T.S. Cale, Presentation II1.9, Fall 2004 Meeting of the Materials Research Society, Nov. 29 – Dec. 3, 2004, Boston, MA.

“Elastic Properties of Silicon Nanoplates”, H. W. Shim, L. G. Zhou, H. Huang, and T. S. Cale, Presentation T4.5, Fall 2004 Meeting of the Materials Research Society, Nov. 29 – Dec. 3, 2004, Boston, MA.

“Microstructure Modeling of MOCVD Zirconium Oxide Deposition”, M. O. Bloomfield, Z. Song, B. R. Rogers and T. S. Cale, AVS 51st International Symposium and Exhibition, Nov. 14-19, 2004, Anaheim, CA.

“Physical and Chemical Characterization of MOCVD Zirconia Films Deposited on Hydrogen-Terminated and Native Oxide Si Surfaces”, B. R. Rogers, Z. Song, R. D. Geil, R. A. Weller, M. O. Bloomfield and T. S. Cale, AVS 51st International Symposium and Exhibition, Nov. 14-19, 2004, Anaheim, CA.

(invited) “Multiscale Transport and Thin Film Microstructure Development”, M. O. Bloomfield, H. Huang and T. S. Cale, 2nd International Conference on Multiscale Materials Modeling (MMM-II), Oct. 11-15, 2004, Los Angeles, CA.

“Mechanics of Nanoplates and Nanowires”, Hanchen Huang, L. G. Zhou, H. W. Shim and T. S. Cale, 2nd International Conference on Multiscale Materials Modeling (MMM-II), Oct. 11-15, 2004, Los Angeles, CA.

“Multiscale Modeling for Interconnects – A Grain Focus”, Timothy S. Cale, Max O. Bloomfield and Hanchen Huang, 2004 Meeting of the Electrochemical Society, Oct. 3-8, 2004, Honolulu, Hawaii.

“Wafer-Level Three-Dimensional ICs: A Better Solution Than SoCs and SiPs?”, R. J. Gutmann, J.-Q. Lu and T. S. Cale, 1st International Wafer Level Packaging Conference, Oct. 10-12, 2004, San Jose, CA.

(invited) “Multiscale Modeling for Interconnects: Status and Opportunities”, Timothy S. Cale, Max O. Bloomfield, Xiang-Yang Liu and Hanchen Huang, James E. Raynolds, Christopher Wells, John T. Welch, and Alain E. Kaloyeros, 21st International VLSI Multilevel Interconnection Conference (VMIC), Sept. 30 – Oct. 2, 2004, Waikoloa Beach, Hawaii.

(invited) “Ballistic Transport and Reaction in Microstructure” Max O. Bloomfield, Xiang-Yang Liu, Timothy S. Cale, World Congress on Computational Mechanics VI, September 5-10, 2004, Beijing, China.

“Atomistic Level Modeling of Semiconductor Processes and Nano-Interconnects”, X.-Y. Liu*, W. Windl, D. Jovanovic, R. Stumpf, T. S. Cale, World Congress on Computational Mechanics VI, September 5-10, 2004, Beijing, China.

“Simulation of Microstructure Formation during Thin Film Deposition”, Max O. Bloomfield and Timothy S. Cale, 2004 IEEE Simulation of Semiconductor Processes and Devices conference (SISPAD), Sep. 1-3, 2004, Munich, Germany.

(invited) “Multiscale Process Modeling in Microelectronics”, Max O. Bloomfield and Timothy S. Cale, International Conference on Computational & Experimental Engineering and Science, July, 2004, Madiera, Portugal

(invited) “Grain-Continuum Methods for Microstructure Formation and Evolution”, Timothy S. Cale and Max O. Bloomfield, 4th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2004), July 24-28, 2004, Jyvaskyla, Finland.

“Back-End Compatibility of Bonding and Thinning Processes for a Wafer-Level 3D Interconnect Technology Platform”, S. Pozder, J.Q. Lu, Y. Kwon, S. Zollner, J. Yu, J.J. McMahon, T.S. Cale, K. Yu, and R.J. Gutmann, Paper 6.2, IITC, June 7-9, 2004, Burlingame, CA.

(invited) “Wafer-Level 3D Hyper-Integration Processing Technology”, J.Q. Lu, T.S. Cale and R.J. Gutmann, 3D Technology, Modeling and Process Symposium, April 13, 2004, Burlingame, CA.

(invited) “Planarization Issues in Wafer-Level 3D Integration”, Jian-Qiang Lu, Timothy S. Cale and Ronald J. Gutmann, Paper K7.7, Materials Research Society meeting, April 12-16, 2004, San Francisco, CA.

“Evaluation of Thin Dielectric-Glue Wafer-Bonding for Three-Dimensional Integrated Circuit-Applications”, Yongchai Kwon, Jian Yu, Jay J McMahon, Jian-Qiang Lu, Timothy S Cale and Ronald J Gutmann, Paper F6.16, Materials Research Society meeting, April 12-16, 2004, San Francisco, CA.

“Fundamental Limits for 3D Wafer-to-Wafer Alignment Accuracy”, Markus Wimplinger, Jian-Qiang (James) Lu, Jian Yu, Yongchai Kwon, Thorsten Matthias, Timothy S. Cale and Ronald J. Gutmann, Paper F6.10, Materials Research Society meeting, April 12-16, 2004, San Francisco, CA.

“Formation and Evolution of Grain Structure in Thin Films”, Max O. Bloomfield and Timothy S.Cale, Materials for Advanced Metallization, March 8-10, 2004, Brussels, Belgium.

“A Kinetic Model for Chemical Vapor Deposition at the Feature Scale”, Matthias K. Gobbert and Timothy S. Cale, AVS Fifth Int. Conf. on Microelectronics and Interfaces (ICMI), March 1-3, 2004, Santa Clara, CA.

“Thermal Cycling Effects on Bond Strength and Residual Stress in Wafer Pairs Bonded with Benzocyclobutene (BCB)”, Y. Kwon, Jian-Qiang Lu, Timothy S. Cale and Ronald J. Gutmann, AVS Fifth Int. Conf. on Microelectronics and Interfaces (ICMI), March 1-3, 2004, Santa Clara, CA.

(invited) “Thermal Effects During Cu CMP”, L. Borucki, A. Philipossian, J. Tichy and T. Cale, AVS Fifth Int. Conf. on Microelectronics and Interfaces (ICMI), March 1-3, 2004, Santa Clara, CA.

“Evolution of Interconnect Microstructures”, Max O. Bloomfield and Timothy S. Cale, AVS Fifth Int. Conf. on Microelectronics and Interfaces (ICMI), March 1-3, 2004, Santa Clara, CA.

(invited) “Multiscale Modeling of Chemical Mechanical Planarization”**,** T.S. Cale and J. A. Tichy and L.J. Borucki, Ninth International Chemical-Mechanical Planarization for ULSI Multilevel Interconnection Conference (CMP-MIC), Los Angeles, CA, Feb. 24-26, 2004.

“Experimental and Theoretical Analysis of Non-Rotating Copper Wafer Polishing”**,** L.J. Borucki, A. Jindal, T.S. Cale, R.J. Gutmann, J.A. Tichy, S.H. Ng and S. Danyluk, Ninth International Chemical-Mechanical Planarization for ULSI Multilevel Interconnection Conference (CMP-MIC), Los Angeles, CA, Feb. 24-26, 2004.

(invited) "3D Hyper-Integration Technology Using Dielectric Adhesive Wafer Bonding and Cu Damascene Inter-Wafer Interconnects", J.-Q. Lu, Timothy S. Cale and Ronald J. Gutmann, International Workshop of 3D System Integration", December 16, 2003, Fraunhofer-Institute, Munich, Germany.

“Bonding Integrity of Oxidized Polydimethylsiloxane (PDMS) Using Four Point Bending”, J.J. McMahon, Y. Kwon, J.-Q. Lu, T.S. Cale, R.J. Gutmann, Fall 2003 Meeting of the Materials Research Society, Dec. 1-5, 2003, Boston, MA.

“A Model Relating Process Variables to Film Properties for Reactively Sputtered Tantalum Oxide Thin Films”, P. Jain, E. Rymaszewski, S. Borg, T.S. Cale, 2003 Annual Meeting of the AIChE, Nov. 17-22, 2003, San Francisco, CA.

“Formation and Evolution of Polycrystalline Microstructure”, M.O. Bloomfield, Y.H. Im, T.S. Cale, 2003 Annual Meeting of the AIChE, Nov. 17-22, 2003, San Francisco, CA.

(invited) “Multiscale and Multistep Process Simulation”, T.S. Cale, M.O. Bloomfield, Y.H. Im, J. Wang, H. Huang, 2003 Annual Meeting of the AIChE, Nov. 17-22, 2003, San Francisco, CA.

"Integrated Multiscale, Multistep Process Simulation for Damascene Structures", Y.H. Im, M.O. Bloomfield, J. Seok, C.P. Sukam, J.A. Tichy, T. S. Cale, 2003 Annual Meeting of the AIChE, Nov. 17-22, 2003, San Francisco, CA.

(invited) "A Wafer-Level 3D IC Technology Platform", R.J. Gutmann, J.-Q. Lu, S. Pozder, Y. Kwon, A. Jindal, M. Celik, J.J. McMahon, K. Yu and T.S. Cale, Advanced Metallization Conference 2003, Oct. 21-23, 2003, Montreal, Canada.

"Simulation of Etching and Sealing of Porous Dielectrics", M.O. Bloomfield, Y.H. Im, and T.S. Cale, Advanced Metallization Conference 2003, Oct. 21-23, 2003, Montreal, Canada.

"Grain Boundary Migration in Metallic Interconnects", M.O. Bloomfield and T.S. Cale, Advanced Metallization Conference 2003, Oct. 21-23, 2003, Montreal, Canada.

"Integrated Multistep Process Simulation with Chip-Scale Structures", M.O. Bloomfield, L.J. Borucki, Y.H. Im, and T.S. Cale, Advanced Metallization Conference 2003, Oct. 21-23, 2003, Montreal, Canada.

"Three Dimensional Feature Profile Evolution during Etching of Porous Dielectric Materials", Y.H. Im, M.O. Bloomfield, T.S. Cale, AVS 50th International Symp., Nov. 2-7, 2003, Baltimore, MD.

(invited) "Technology of Monolithic Wafer-Level 3D Hyperintegration", J.-Q. Lu, T.S.Cale and R.J. Gutmann, Peaks Wafer Level Packaging International Symposium, Oct. 8-10, 2003; Whitefish, MT.

"Plasma Etching of Porous Dielectric Substrates", M.O. Bloomfield, Y.H. Im, and T.S. Cale, 204th Meeting of the Electrochemical Society, Oct. 12-16, 2003, Orlando, FL.

"Microstructure Development and Evolution" M.O. Bloomfield, Y.H. Im, and T.S. Cale, 2003 IEEE International Conference on Simulation of Semiconductor Processes and Devices (SISPAD), Sept. 3-5, 2003, Boston, MA.

"Developing the Structure of a Cu CMP Model" J. Seok, C.P. Sukam, L.J. Borucki, A. Jindal, J.A. Tichy, R.J. Gutmann, and T.S. Cale, 2003 IEEE International Conference on Simulation of Semiconductor Processes and Devices (SISPAD), Sept. 3-5, 2003, Boston, MA.

"Integrated Multiscale Multistep Process Simulation" Y.H. Im, M.O. Bloomfield, J. Seok, C.P. Sukam, J.A. Tichy and T.S. Cale, 2003 IEEE International Conference on Simulation of Semiconductor Processes and Devices (SISPAD), Sept. 3-5, 2003, Boston, MA.

(invited) "Thin Film Microstructure Simulation for Integrated Circuit Manufacturing", T.S. Cale, M.O. Bloomfield and Y.H. Im, 5th EuroMech Solid Mechanics Conference (ESMC-5), Aug. 17-22, 2003, Thessaloniki, Greece.

(invited) "Development of Microstructure in Nanostructures and Thin Films", Max O. Bloomfield, Yeon Ho Im, Jian Wang, Hanchen Huang, and Timothy S. Cale, SPIE First International Symposium on Microtechnologies for the New Millennium 2003, May 19-21, 2003, Gran Canaria, Canary Islands, Spain.

"Evaluation Procedures for Wafer Bonding and Thinning of Interconnect Test Structures for 3D ICs, J.-Q. Lu, A. Jindal, Y. Kwon, J.J. McMahon, T.S. Cale and R.J. Gutmann, 2003 International Interconnect Technology Conference (IITC), June 2-4, 2003, San Francisco, CA.

"Modeling of Thermal Dynamics and Mechanical Stress in 3D-IC Structure", J. Zhang, J.-Q. Lu, R. Gutmann, and T. Cale, 203rd Meeting of The Electrochemical Society (ECS), Paris, France, April 27-May 2, 2003.

(invited) “3D System-on-a-Chip using Dielectric Glue Bonding and Cu Damascene Inter-Wafer Interconnects” J.-Q. Lu, T. Cale, and R. Gutmann, 203rd Meeting of The Electrochemical Society (ECS), Paris, France, April 27-May 2, 2003.

“Wafer Bonding and Thinning Integrity for 3D-IC Fabrication”, Y. Kwon, A. Jindal, J.J. McMahon, T.S. Cale, R.J. Gutmann, and J.-Q. Lu, 203rd Meeting of The Electrochemical Society (ECS), Paris, France, April 27-May 2, 2003.

“Effect of Plasma Sulfur Activation of SiLK on the Adhesion of Copper”, D.-L. Bae, J.J. Senkevich, Y. Kwon, and T.S. Cale, 203rd Meeting of The Electrochemical Society (ECS), Paris, France, April 27-May 2, 2003.

"A Multiscale Mechanical CMP Model for Patterned Wafers", C. P. Sukam, J. Seok, A. T. Kim, J. A. Tichy and T. S. Cale, 203rd Meeting of the Electrochemical Society (ECS), April 27-May 2, 2003, Paris, France.

"Integrated Multiscale Process Simulation of Damascene Structures", M. O. Bloomfield, Yeon Ho Im, J. Seok, C. P. Sukam, J. A. Tichy and T. S. Cale, 203rd Meeting of the Electrochemical Society (ECS), April 27-May 2, 2003, Paris, France.

“Wafer Level Assembly of Heterogeneous Technologies”, J.-Q. Lu, A. Jindal, P. D. Persans, T. S. Cale and R. J. Gutmann, MANTECH 2003, Scottsdale, AZ, May, 19-22, 2003.

“Dielectric-Glue Wafer-Bonding for 3-D ICs”, Y. Kwon, A. Jindal, J.J. McMahon, J.-Q. Lu, R.J. Gutmann, T.S. Cale, MRS Spring Meeting, April 22-25, 2003, San Francisco, CA,

“Wafer Thinning for Monolithic 3D Integration”, A. Jindal, J.-Q. Lu, Y. Kwon, G. Rajagopalan, J.J. McMahon, A.Y. Zeng, H.K. Flesher, T.S. Cale, R.J. Gutmann, MRS Spring Meeting, April 22-25, 2003, San Francisco, CA.

"Modeling of Surface Profile Evolution of Patterned Wafers during Chemical Mechanical Polishing", C.P. Sukam, J. Seok, A. T. Kim, J.A. Tichy and T.S. Cale, European Workshop on Materials for Advanced Metallization (MAM), Mar. 9-12, 2003, Aix-Marseille, France.

"Integrated Multiscale, Multistep Process Simulation for Damescene Structures", J. Seok, M.O. Bloomfield, Y.H. Im, C.P. Sukam, J. A. Tichy and T.S. Cale, European Workshop on Materials for Advanced Metallization (MAM), Mar. 9-12, 2003, Aix-Marseille, France.

"An Integrated Multiscale Chemical Mechanical Planarization Model for Patterned Wafers with Surface Evolution", C.P. Sukam, J. Seok, A.T. Kim, J.A. Tichy and T.S. Cale, 4th International Conference on Microelectronics and Interfaces (ICMI’03), March 3-6, 2003, Santa Clara CA.

“Coalescence of Nanoscale Islands During Polycrystalline Thin Film Growth”, M.O. Bloomfield, Y.H. Im, H. Huang and T.S. Cale, 4th International Conference on Microelectronics and Interfaces (ICMI’03), March 3-6, Santa Clara, CA.

“Characterization of Key Processing Steps for 3D-ICs using Dielectric Glue Bonding and Cu Damascene Inter-Wafer Interconnects”, J.-Q. Lu, A. Jindal, Y. Kwon, J. McMahon, B. Altemus, D. Cheng, E.T. Eisenbraun, T.S. Cale, and R.J. Gutmann, 4th International Conference on Microelectronics and Interfaces (ICMI’03), March 3-6, Santa Clara, CA.

“Feature Scale Modeling for Chip-Scale Models Of Pattern Density Effects During ECD”, Y.H. Im, M.O. Bloomfield and T.S. Cale, 4th International Conference on Microelectronics and Interfaces (ICMI’03), March 3-6, Santa Clara, CA.

"Evaluation of Wafer Bonding and Thinning for 3D-IC Fabrication", Y. Kwon, A. Jindal, J. J. McMahon, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, 4th International Conference on Microelectronics and Interfaces (ICMI'03), March 3-6, Santa Clara, CA.

"Direct Copper Metallization on Low-k SiLK Activated by Plasma Enhanced Chemical Vapor Deposition (PE-CVD) of Sulfur", D.-L. Bae, J.J. Senkevich, Y. Kwon, and T.S. Cale, 4th International Conference on Microelectronics and Interfaces (ICMI'03), March 3-6, 2003, Santa Clara, CA.

(invited) "Integrated Multiscale and Multistep Process Simulation", M.O. Bloomfield, Y.H. Im, J. Seok, C.P. Sukam, J.A. Tichy, and T.S. Cale, Eighth international CMP-MIC Conference, Feb. 19-21, 2003, Marina Del Rey, CA.

(invited) "Planarization Issues for Three-Dimensional (3D) ICs and Wafer-Scale Packaging (WSP) Applications", R.J. Gutmann, A. Jindal, G. Rajagopalan, J.-Q. Lu, J.J. McMahon, Y. Kwon and T.S. Cale, Eighth international CMP-MIC Conference, Feb. 19-21, 2003, Marina Del Rey, CA.

"Wafer-Level High Density Multifunctional Integration (HDMI) for Low-Cost Micro/Nano/Electro Opto/Bio Heterogeneous Systems", R.J. Gutmann, J.-Q. Lu, J.J. McMahon, P.D. Persans, T.S. Cale, E.T. Eisenbraun, J. Castracane and A.E. Kaloyeros, Nanotech 2003, February 23-27, 2003, San Francisco, CA.

"Modeling of Material Removal for Fixed Abrasive CMP: Blanket Wafers," C. P. Sukam, J. Seok, A. T. Kim, J. A. Tichy and T. S. Cale, Walter Lincoln Hawkins Graduate Research Conference 2002, Oct. 17, 2002, Rensselaer Polytechnic Institute, Troy, NY.

"Reduction in Contact Resistance by Using a Modified Barrier Process and Understanding the Step Coverage Limitations Using the EVOLVE Simulation Program", Ardy Sidhwa, Todd Gandy, Michael Goulding, Chuck Spinner, Vinay Prasad, Timothy Cale, 19th International VLSI Multilevel Interconnection Conference (VMIC), Nov. 18-20, 2002, Singapore.

(invited) "Processing Technology for High Density Multifunctional Integration (HDMI) Using Wafer Bonding and Monolithic Inter-Wafer Interconnection, J.-Q. Lu, Y. Kwon, A. Jindal, K.-W. Lee, J.J. McMahon, G. Rajagopalan, A. Y. Zeng, R. P. Kraft, B. Altemus, B. Xu, E. Eisenbraun, J. Castracane, J. F. McDonald, T. S. Cale, A. E. Kaloyeros, R. J. Gutmann, 19th International VLSI Multilevel Interconnection Conference (VMIC), Nov. 18-20, 2002, Singapore.

(invited) "Integrated Multiscale Process Simulation," T. S. Cale, M. O. Bloomfield, J. Seok, C. P. Sukam, and J. A. Tichy, presented during the 19th International VLSI Multilevel Interconnection Conference (VMIC), Nov. 18-20, 2002, Singapore.

"Parallel Numerical Solution of the Boltzmann Equation for Atomic Layer Deposition", Samuel G. Webster, Matthias K. Gobbert, Jean-Francois Remacle and Timothy S. Cale, presented during Euro-Par 2002, Paderborn, Germany, August 29, 2002.

(invited) B. Melnick and T. S. Cale, "Summary of AMC 2002", presented during the Advanced Metallization Asia, Oct. 29-30, 2002, University of Tokyo, Tokyo, Japan.

(invited) M. O. Bloomfield, Y.-H. Im, H.Huang, and T.S. Cale, 'Coalescence of Nanoscale Islands into Polycrystalline Thin Films' International Union of Theoretical and Applied Mechanics Symposium on Multiscale Modeling and Characterization of Elastic-Inelastic Behavior of Engineering Materials (IUTAM), Oct. 20, 2002, Marrakech, Morroco.

"Feature Profile Evolution during Cl_2 and HBr Plasma Etching of Silicon", Y. H. Im, M. O. Bloomfield and Timothy S. Cale, presented during the AVS 47th International Symposium, Denver, CO, Nov. 3-8, 2002.

"Application of a global-local random-walk algorithm for thermal analysis of 3D integrated circuits", J. Kalyanasundharam, R. B. Iverson, E. T. Thompson, V. Prasad, T. S. Cale, R. J. Gutmann, Y. Le Coz, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

"Improving ALD Pulse Protocols", V. Prasad, M. K. Gobbert, T. S. Cale, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

"Grain Formation during Polycrystalline Thin Film Growth", M.O. Bloomfield, Y.H. Im, H. Huang, and T.S. Cale, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

“Processing of inter-wafer vertical interconnects in 3D ICs”, K. W. Lee, J. Q. Lu, Y. Kwon, G. Rajagopalan, M. Gupta, J. McMahon, A. Y. Zeng, R. P. Kraft, J. F. McDonald, T. S. Cale, R. J. Gutmann, B. Xu, B. Altemus, E. Eisenbraun, J. Castracane, A. Kaloyeros, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

“Pattern density effects on film profile evolution in copper electrochemical deposition”, Yeon Ho Im, Max O. Bloomfield, Timothy S. Cale, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

“An Integrated Multiscale Mechanical Model for Chemical Mechanical Planarization,” J. Seok, C. P. Sukam, A. T. Kim, J. A. Tichy and T. S. Cale, presented during the Advanced Metallization Conference 2002, Oct. 1-3, 2002, San Diego, CA.

“Grain Formation During Polycrystalline Thin Film Growth”, Max O. Bloomfield, Yeon Ho Im, and Timothy S. Cale, presented during the Second ECS International Semiconductor Technology Conference (ISTC), Sept. 12-14, 2002, Tokyo, Japan.

“Pattern Density Effects on Film Profile Evolution During ECD”, Yeon Ho Im, Max O. Bloomfield, Suchira Sen, and Timothy S. Cale, presented during the Second ECS International Semiconductor Technology Conference (ISTC), Sept. 12-14, 2002, Tokyo, Japan.

“A Statistical Integrated Multiscale CMP Model with Surface Evolution,” C. P. Sukam, J. Seok, A. T. Kim, J. A. Tichy and T. S. Cale, presented during the Second ECS International Semiconductor Technology Conference (ISTC), Sept. 12-14, 2002, Tokyo, Japan.

“A Framework for Simulation of Materials Processing on the Island, Grain, And Reactor Scales”, M. O. Bloomfield, V. Prasad, O. Klaas, and T. S. Cale, International Conferences on Modern Materials and Technologies (CIMTEC 2002), July 14-18, 2002.

(invited) “Coalescence and Evolution of Nanoscale Islands into Polycrystalline Thin Films”, M. O. Bloomfield, D. F. Richards, D. Datta, O. Klaas, M. S. Shepherd, and T. S. Cale, presented during the Fifth World Congress on Computational Mechanics (WCCM V), Vienna, Austria, July 7-12, 2002.

(Keynote) “Simulation of Materials Processing on the Island, Grain and Reactor Scales”, M.O. Bloomfield, V. Prasad, D. Datta, O. Klaas, M.S. Shephard, and T.S. Cale, presented during Multiscale Materials Modelling, London, England, June 17-20, 2002.

(invited) “Integrated Multiscale Process Simulation: Equipment to Microstructure”, Timothy S. Cale, Max O. Bloomfield, Yeon Ho Im, and Kenneth E. Jansen, presented during the 8th IUMRS International Conference on Electronic Materials, Xian, China, Jun 10-14, 2002.

"A Wafer-Scale 3D IC Technology Platform using Dielectric Bonding Glues and Copper Damascene Patterned Inter-Wafer Interconnects", J.-Q. Lu, Y. Kwon, G. Rajagopalan, M. Gupta, J. McMahon, K.-W. Lee, R.P. Kraft, J. F. McDonald, T.S. Cale, R.J. Gutmann, B. Xu, E. Eisenbraun, J. Castracane, and A. Kaloyeros, presented during the 2002 IEEE International Interconnect Technology Conference (IITC), San Francisco, CA, June 3-5, 2002.

“Prediction of Deposition Rates in Plasma-Enhanced Atomic Layer Deposition”, V. Prasad, S. C. Foster, M. K. Gobbert, and T. S. Cale, presented during the 201st Electrochemical Society Spring 2002 Meeting, Philadelphia, PA, May 12-17, 2002.

“Transient Multiscale Modeling of Electrochemical Deposition”, S. Sen, M. Bloomfield, K. Jansen, and T. Cale, presented during the 201st Electrochemical Society Spring 2002 Meeting, Philadelphia, PA, May 12-17, 2002.

“Transient Transport and Reactant-Wafer Interactions: Adsorption and Desorption”, S. G. Webster, M. K. Gobbert, V. Prasad, and T. S. Cale, presented during the 201st Electrochemical Society Spring 2002 Meeting, Philadelphia, PA, May 12-17, 2002.

(invited) ‘Multiscale Mechanical Modeling of CMP”, J. Seok, C. P. Sukam, J. A. Tichy, and T. S. Cale, presented during the 201st Electrochemical Society Spring 2002 Meeting, Philadelphia, PA, May 12-17, 2002.

“Multiscale Modeling of the Development Of 3-Dimensional Grain Structures”, M. O. Bloomfield, D. F. Richards, V. Prasad, O. Klaas, D. Datta, M. S. Shephard, and T.S. Cale, presented during the 2002 MRS Spring Meeting, San Francisco, CA, April 1-5, 2002.

“Modeling of Material Removal for Fixed Abrasive CMP”, C. P. Sukam, J. Seok, A. T. Kim, J. A. Tichy, and T. S. Cale, presented during the Seventh International CMP-MIC Conference, Feb. 27 – Mar. 1, 2002, Santa Clara, CA.

"Modeling of the Material Removal for Chemical Mechanical Planarization," C. P. Sukam, J. Seok, A. T. Kim, J. A. Tichy and T. S. Cale, presented during the AVS Third International Conference on Microelectronics and Interfaces, February 11-15, 2002, Santa Clara, California.

“Simulation of Materials Processing on the Island, Grain, and Reactor Scales”, M. O. Bloomfield, V. Prasad, D. Datta, O. Klaas, M. S. Shephard, and T. S. Cale, presented during the AVS Third International Conference on Microelectronics and Interfaces (ICMI), February 14, 2002.

“Prediction of Deposition Rates in Atomic Layer Deposition”, V. Prasad, M. K. Gobbert, and T. S. Cale, presented during the AVS Third International Conference on Microelectronics and Interfaces (ICMI), February 2002.

“Wafer Bonding Using Dielectric Polymer Glues in 3D Integration”, Yongchai Kwon, Jian-Qiang Lu, Russell P. Kraft, John F. McDonald, Ronald J. Gutmann and Timothy S. Cale, presented during the 2001 Materials Research Society (MRS) Fall Meeting, November 26-30, 2001, Boston, Massachusetts.

"Multiscale Simulation of the Development and Coalescence of 3-Dimensional Grain Structures", Max O. Bloomfield, Ottmar Klaas, Vinay Prasad, Jing Lu, Antoinette M. Maniatty and Timothy S. Cale, presented during the MRS Fall Meeting, November 26-30, 2001, Boston, Massachusetts.

(Invited) “Three-Dimensional (3D) ICs: A Technology Platform for Integrated Systems and Opportunities for New Polymeric Adhesives”, R.J. Gutmann, J.-Q. Lu, Y. Kwon, J.F. McDonald and T.S. Cale, presented during the 1st International IEEE Conference on Polymers and Adhesives in Microelectronics and Photonics (Polytronic 2001), Potsdam, Germany, October 21-24, 2001.

"A Multiscale Contact Mechanics and Hydrodynamics Model of Chemical Mechanical Polishing”, Andrew T. Kim, John A. Tichy and Timothy S. Cale, presented during the Eighteenth International VLSI Multilevel Interconnect Conference, Nov. 28 - 29, 2001, Santa Clara, CA

(Invited)“Design and Fabrication of Damascene Patterned Interconnections for “Face-to-Face” Wafer Bonded 3D-Stacked IC Via Chain Test Structures”, J.-Q. Lu, O. Ergodan, Y. Kwon, G. Rajagopalan, D.-L. Bae, C. K. Hong, M. Gupta, J. McMahon, R. P. Kraft, P. M. Belemjian, T. S. Cale, J. F. McDonald and R. J. Gutmann, B. Xu, E. Eisenbraun, and J. Castracane, presented during the Eighteenth International VLSI Multilevel Interconnection (VMIC) Conference, Nov. 28 - 29, 2001, Santa Clara, CA.

"Modeling and Simulation Opportunities for 3D Integrated Circuits", V. Prasad, M.O. Bloomfield, J. Lu, O. Klaas, A. Maniatty, M. S. Shephard and T. S. Cale, presented during the Eighteenth International VLSI Multilevel Interconnect Conference, Nov. 28 - 29, 2001, Santa Clara, CA.

(Invited) “Integrated Multiscale Simulation of Copper Electrochemical Deposition”, M. O. Bloomfield, S. Sen, K. E. Jansen, and T. S. Cale, presented during the Eighteenth International VLSI Multilevel Interconnect Conference, Nov. 28 - 29, 2001, Santa Clara, CA.

"A Feature Scale Model for Atomic Layer Deposition", M. K. Gobbert, V. Prasad, M. O. Bloomfield and T. S. Cale, presented during the Eighteenth International VLSI Multilevel Interconnect Conference, Nov. 28 - 29, 2001, Santa Clara, CA.

“Fabrication of Via-Chain Test Structures for 3D IC Technology using Dielectric Bonding of 200 mm Wafers”, J.-Q. Lu, Y. Kwon, G. Rajagopalan, M. Gupta, D.-L. Bae, J. McMahon, C.K. Hong, R. P. Kraft, O. Ergodan, P.M. Belemjian, , J. F. McDonald, T. S. Cale and R. J. Gutmann, B. Xu, E. Eisenbraun, J. Castrance and A. Kaloyeros, presented during the Advanced Metallization Conference, October 9-11, 2001, Montreal, Canada.

"A Transport and Reaction Model for Atomic Layer Deposition", M. K. Gobbert, V. Prasad, M. O. Bloomfield and T. S. Cale, presented during the Advanced Metallization Conference, October 9-11, 2001, Montreal, Canada.

"Modeling and Simulation Opportunities for 3D Integrated Circuits", Max O. Bloomfield, Vinay Prasad, Jing Lu, Ottmar Klaas, Antoinette M. Maniatty, Mark S. Shephard and Timothy S. Cale, presented during the Advanced Metallization Conference, October 9-11, 2001, Montreal, Canada.

"A Tool for the Representation, Evolution, and Coalescence of 3-Dimensional Grain Structures", M. O. Bloomfield, D. F. Richards and T. S. Cale, presented during the Sixth United States National Congress on Computational Mechanics, August 1-3, 2001, Dearborn, MI.

“Wafer Bonding Using Low-k Dielectrics as Bonding Glue in Three- Dimensional Integration”, Y. Kwon, J.-Q. Lu, R. J. Gutmann, R. P. Kraft, J. F. McDonald and T. S. Cale, presented during the 200th Meeting of The Electrochemical Society, Inc. and the 52nd Meeting of The International Society of Electrochemistry (ECS/ISE), September 2-7, 2001, San Francisco, CA.

"Effectiveness of Pulsed Cu ECD in Void Reduction in Feature Fills", S. Sen, S. Soukane and T. S. Cale, presented during the 200th Meeting of The Electrochemical Society, Inc. and the 52nd Meeting of The International Society of Electrochemistry (ECS/ISE), September 2-7, 2001, San Francisco, CA.

"Connecting the Evolution and Coalescence of 3-Dimensional Grain Structures to Reactor-Scale Phenomena", Max O. Bloomfield, David F. Richards, Ottmar Klaas, Jing Lu, Antoinette M. Maniatty, and Timothy S. Cale, presented during the 200th Meeting of The Electrochemical Society, Inc. and the 52nd Meeting of The International Society of Electrochemistry (ECS/ISE), September 2-7, 2001, San Francisco, CA.

"A Multi-scale Elasto-Hydrodynamic Contact Model of Chemical Mechanical Planarization", Andrew T. Kim, John A. Tichy and Timothy S. Cale, presented during the 48th AVS Fall Meeting, Oct. 29- Nov. 2, San Fransicsco, CA.

"Connecting the Evolution and Coalescence of 3-Dimensional Grain Structures to Reactor-Scale Phenomena", Max O. Bloomfield, David F. Richards, Ottmar Klaas, Jing Lu, Antoinette M. Maniatty, Timothy S. Cale and Mark S. Shephard, presented during the 48th AVS Fall Meeting, Oct. 29- Nov. 2, San Fransicsco, CA.

"Plasma Processing in Multilevel Metallization Process Flows", Hong Liang, Max Bloomfield and Timothy S.Cale, presented during the 3rd International Symposium on Applied Plasma Science, held July 2-6 Fairbanks, Alaska.

"Modeling and Simulation of Plasma Enhanced Processing for Integrated Circuit Fabrication", Max O. Bloomfield, Vinay Prasad, David F. Richards and Timothy S. Cale, presented at the 3rd International Symposium on Applied Plasma Science, Fairbanks, Alaska, held July 2-6.

“Stacked Chip-to-Chip Interconnections Using Wafer Boding Technology with Dielectric Bonding Glues”, J.-Q. Lu, Y. Kwon, R. P. Kraft, R. J. Gutmann, J. F.. McDonald, and T. S. Cale, presented during the 2001 IEEE International Interconnect Technology Conference (IITC 2001), held June 4-6, 2001, San Francisco, CA.

“Multi-Scale Finite element Model for CMP”, A. T. Kim, J. A. Tichy, and T. S. Cale, presented during the First International Conference on Semiconductor Technology (ISTC 2001), held May 27-30, 2001, Shanghai, China.

“Microloading During Electrochemical Deposition: Integrated Multiscale Process Simulation”, M. O. Bloomfield, S. Soukane, K. E. Jansen, and T. S. Cale, presented during the First International Conference on Semiconductor Technology (ISTC 2001), held May 27-30, 2001, Shanghai, China.

“Multiscale Modeling of Chemical Mechanical Planarization Processes”, T. S. Cale, A. Kim and J. A. Tichy, presented during Society of Tribologists and Lubrication Engineers 2001, May 20-24, 2001, Orlando, FL.

“A Boltzmann Transport and Reaction Model for Atomic Layer Deposition” M. K. Gobbert and T. S. Cale, presented during the AVS Topical Conference on Atomic Layer Deposition, held May 14, 15, Monterey, CA.

“Integrated Multiscale Simulation of Copper Electrochemical Deposition Processes”, M. Bloomfield, K. Jansen, and T. Cale, presented during the 199th Electrochemical Society Meeting, held March 25-29, 2001, Washington, DC.

“Mesoscale Modeling for LPCVD in the Transition Regime”, M. K. Gobbert and T. S. Cale, presented during the 199th Electrochemical Society Meeting, held March 25-29, 2001, Washington, DC.

“CMP Wafer and Asperity Scale Models”, A. T. Kim, J. A. Tichy, and T. S. Cale, presented during the 2001 Proceedings Sixth International Chemical-Mechanical Planarization for ULSI Multilevel Interconnection Conference (CMP-MIC) held March 7-9, 2001, Santa Clara, CA.

“200 mm Wafer Bonding for 3-D Interconnects Using Low-k Dielectrics as Bonding Glues”, J.-Q. L, Y. Kwon, R.P. Kraft, R. J. Gutmann, J. F. McDonald, and T. S. Cale, presented during the Seventh International Conference on Dielectrics and Conductors for the ULSI Multilevel Interconnection, (DUMIC 2001), held March 6-7, 2001, Santa Clara, CA.

"Multiscale CMP Finite Element Contact Model: Wafer and Feature Scale", A. Kim, J. Tichy, T. S. Cale, Rensselaer Polytechnic Institute, presented during the AVS ICMI-Second International Conference on Microelectronics and Interfaces, held February 5-8, 2001, Santa Clara, CA.

"Multiscale Modeling of Pattern Loading Effects in Copper Electrochemical Deposition", M. O. Bloomfield, S. Soukane, K. E. Jansen, T. S. Cale, Rensselaer Polytechnic Institute, presented during the AVS ICMI-Second International Conference on Microelectronics and Interfaces, held February 5-8, 2001, Santa Clara, CA.

"Electrodeposition of Copper in Microstructures: Feature Scale Modeling of Pulse Plating", S. S. Sen, T. S. Cale, Rensselaer Polytechnic Institute, presented during the AVS ICMI-Second International Conference on Microelectronics and Interfaces, held February 5-8, 2001, Santa Clara, CA.

“Modeling of Feature Superfilling in Copper Electrochemical Deposition”, S. Sen, S. Soukane, and T. S. Cale, presented during the 198th Meeting of the Electrochemical Society, held Oct. 22-27, 2000, Phoenix, AZ.

“Some Effects of Hydrogen on Cu (TMVS)(hfac) Sourced CVD of Cu Films”, J. Hong, S. Shetty, D. Yang, T. S. Cale, presented during the 198th Meeting of the Electrochemical Society, held Oct. 22-27, 2000, Phoenix, AZ.

“CMP Finite Element Contact Model: Wafer and Feature Scale”, A. T. Kim, J. A. Tichy and T. S. Cale, presented during the 198th Meeting of the Electrochemical Society, held Oct. 22-27, 2000, Phoenix, AZ.

“Multiscale Modeling of Electrochemical Deposition and Microloading Effects”, M. O. Bloomfield, K. E. Jansen and T. S. Cale, presented during the 198th Meeting of the Electrochemical Society, held Oct. 22-27, 2000, Phoenix, AZ.

“3-D Integration Using Wafer Bonding Techniques”, J.-Q. Lu, A. Kumar, Y. Kwon, E. Eisenbraun, R. P. Kraft, J. F. McDonald, R. Gutmann, T. Cale, P. Belemjian, O. Ergodan, A. Kaloyeros, J. Castracane and E. Eisenbraun, presented during the Advanced Metallization Conference, Sept. 28-30, 2000, San Diego, CA.

“Finite Element Analysis of CMP Pad Displacement and Slurry Flow Characteristics”, A. T. Kim, J. A. Tichy and T. S. Cale, presented during the Advanced Metallization Conference, Sept. 28-30, 2000, San Diego, CA.

“Multiscale Modeling of Pattern Density Effects on Elecrtochemical Deposition with Leveling Agents”, M. O. Bloomfield, K. E. Jansen and T. S. Cale, presented during the Advanced Metallization Conference, Sept. 28-30, 2000, San Diego, CA.

“Effects of Hydrogen on the Film Properities of Cu (TMVS)(hfac) Sourced CVD Copper”, J. Hong, D. Yang, S. Shetty, and T. S. Cale, presented during the American Vacuum Society, 47th International Symposium, Oct. 2-6, 2000, Boston, MA.

“Extension Velocities for Level Set Based Suface Pofile Evolution”, D. F. Richards, S. Sen, M. O. Bloomfield, and T. S. Cale, presented during the American Vacuum Society, 47th International Symposium, Oct. 2-6, 2000, Boston, MA.

“Models of Electrochemical Deposition of Copper Thin Films”, S. Soukane, S. Sen, T. S. Cale, presented during the American Vacuum Society, 47th International Symposium, Oct. 2-6, 2000, Boston, MA.

(Invited) “Multiscale Process Modeling for Integrated Circuit Fabrication”, T. S. Cale, S. Soukane, D. F. Richards, M. O. Bloomfield and K. Jansen, Multiscale Materials Modeling Symposium of the International Union of Materials Research Societies – 6th International Conference in Asia, July 23-26, 2000, Hong Kong, China.

(Invited) "Integrated Multiscale Process Simulator for LPCVD", T.S. Cale, T.P. Merchant, L.J. Borucki, M.K. Gobbert, and A.H. Labun, presented during the Seventeenth International VLSI Multilevel Interconnections Conference (VMIC), June 26-30, 2000, Santa Clara, CA.

"Feature Superfilling Using Leveling Agents in Copper Plating", S. Soukane and T. S. Cale, presented during the Seventeenth International VLSI Multilevel Interconnections Conference (VMIC), June 26-30, 2000, Santa Clara, CA.

"Face to Face Wafer Bonding for 3D Chip Stack Fabrication to Shorten Wire Lengths", J.F. McDonald, R.P. Kraft, J.-Q. Lu, A. Kumar, T.S. Cale, T.-M. Lu, P. Belemjian, O. Erdogan, and Y. Kwon, presented during the Seventeenth International VLSI Multilevel Interconnections Conference (VMIC), June 26-30, 2000, Santa Clara, CA.

(Invited) "Multiscale Process Modeling for Integrated Circuit Fabrication", T. S. Cale, S. Soukane, D. F. Richards, M. O. Bloomfield and K. Jansen, presented during the "IMA Workshop on Multiscale Modeling", June 5-9, 2000, Minneapolis, MN.

"Modeling Ionized Magnetron Sputtering of Copper", M. Bloomfield, D. F. Richards and T. S. Cale, presented during the 197th Meeting of the Electrochemical Society, May 14-19, 2000, Toronto, Canada.

"Activation Energy Study for the Nucleation and Growth Stages of Cu(TMVS)(hfac) Sourced Copper CVD", D. Yang, J. Hong and T. S. Cale, presented during the 197th Meeting of the Electrochemical Society, May 14-19, 2000, Toronto, Canada.

"Modeling of Aspect Ratio Dependent Etching",Max Bloomfield, D. F. Richards, S. Soukane and T. S. Cale, presented during the 197th Meeting of the Electrochemical Society, May 14-19, 2000, Toronto, Canada.

"Evolution of Surface Morphology During Cu(TMVS)(hfac) Sourced Copper CVD", D. Yang, J. Hong and T. S. Cale, presented during the Spring 2000 MRS Meeting, April 24-28, 2000, San Francisco, CA.

"Some Opportunities for Materials Modeling in Microelectronics", D. F. Richards, T. S. Cale, presented during the Spring 2000 MRS Meeting, April 24-28, 2000, San Francisco, CA.

"Modeling of Ionized Magnetron Sputtering of Copper", M. Bloomfield, D. F. Richards and T. S. Cale, presented during the Spring 2000 MRS Meeting, April 24-28, 2000, San Francisco, CA.

"Activation Energy Study for the Nucleation and Growth Stages of Cu(TMVS)(hfac) Sourced Copper CVD", D. Yang, J. Hong and T.S. Cale, presented during the American Vacuum Society 2nd International Conference on Advanced Materials and Processes for Microelectronics, February 7 - 10, 1999, Santa Clara, CA.

"Effects of Water Vapor during the Nucleation and Growth Stages of Cu(TMVS)(hfac) Sourced Copper CVD", D. Yang, J. Hong and T.S. Cale, presented during the American Vacuum Society 2nd International Conference on Advanced Materials and Processes for Microelectronics, February 7 - 10, 1999, Santa Clara, CA.

(Invited) "Finite Element Analysis of CMP Pad and Slurry Behavior", J. A. Tichy, C. J. Clutz, T. S. Cale, L. Shan and S. Danyluk, presented during the American Vacuum Society 2nd International Conference on Advanced Materials and Processes for Microelectronics, February 7 - 10, 2000, Santa Clara, CA.

(Invited) "CMP Pad Displacement and Slurry Flow Characteristics" Finite Element Analysis", J. A. Tichy, C. J. Clutz and T. S. Cale, presented during the Fifth International Chemical Mechanical Polish for ULSI Multilevel Interconnection Conference, March 2-3, 2000, Santa Clara, CA.

"Aspect Ratio Dependent Etching", M. O. Bloomfield, S. Soukane and T. S. Cale, presented during the AIChE Fall 1999 Meeting, November 1-5, 1999, Dallas, TX.

"Aspect Ratio Dependent Etching", T. S. Cale, M. Bloomfield and S. Soukane, presented at the AVS International Symposium: Vacuum, Thin Films, Surfaces/Interfaces, and Processing, Oct 25-29, 1999, Seattle, Washington.

"Composition of Si/Ge Films in Structures", S. Soukane, T. S. Cale, C. Werner, A. Kersh and M. Bloomfield, presented at the AVS 46th International Symposium: Vacuum, Thin Films, Surfaces/Interfaces, and Processing, Oct 25-29, 1999, Seattle, Washington.

"Effects of Process Variables on Cu(TMVS)(hfac) Sourced Copper CVD Films", D. Yang, J. Hong and T. S. Cale, presented during the Advanced Metalization Conference, Sept 28-30, 1999, Orlando, Florida.

"Simulation of Ionized Magnetron Sputtering of Copper", M. Bloomfield and T. S. Cale, presented during the Advanced Metalization Conference, Sept 28-30, 1999, Orlando, Florida.

"Applications of Plasma Processes in Microelectronics", D. F. Richards, M. O. Bloomfield, S. Soukane and T. S. Cale, presented during the 2nd International Symposium of Applied Plasma Science, Sept. 20-24, 1999, Osaka, Japan.

(Invited) "Research at the NY State SIA Focus Center", T. S. Cale, presented during the 4th International Symposium on Chemical Mechanical Polishing, August 8-11, 1999, Lake Placid, New York.

"Recent Applications of EVOLVE", M. O. Bloomfield, D. F. Richards, S. Soukane, and T. S. Cale, MRS Workshop on Advances in Thin Film Simulations and Experimental Verification, June 23-25, 1999, San Jose, CA.

(Invited) "Roles of Transport and Reaction Modeling for Topography Relevant Processes", presented during the MRS Workshop on Advances in Thin Film Simulations and Experimental Verification, June 23-25, 1999, San Jose, CA.

(Keynote) "Opportunities for Materials Modeling in Microelectronics", T. S. Cale, presented during the Multiscale Materials Modeling Symposium of the 1999 Meeting of the International Union of Materials Research Societies, June 1999, Bejing, China.

"Composition of Si/Ge Films in Structures", S. Soukane, C. Werner, A. Kersch, M. Bloomfield, and T. S. Cale, presented at the American Vacuum Society 1st International Conference on Advanced Materials and Processes for Microelectronics, March 15-18, 1999, San Jose, CA.

"The Use of Topography Simulation in Process Integration", T. S. Cale, T. P. Merchant, and L. J. Borucki, presented at the American Vacuum Society 1st International Conference on Advanced Materials and Processes for Microelectronics, March 15-18, 1999, San Jose, CA.

"Conformality of LPCVD Silicon Dioxide Films from TEOS: Mechanism Validation", A. Labun, P. Ho, H. Moffat, M. E. Coltrin and T. S. Cale, presented during the American Vacuum Society 1st International Conference on Advanced Materials and Processes for Microelectronics, March 15-18, 1999, San Jose, CA.

"Improved Microstructure by Programmed Rate Chemical Vapor Deposition Processes", D. Yang, R. Jonnalagadda, B. R. Rogers, J. T. Hillman, R. F. Foster and T. S. Cale, presented during the Fall 1998 meeting of the MRS, Nov 30 – Dec 4, 1998, Boston, MA.

"Nucleation of CVD Aluminum on Titanium Nitride, Tantalum Nitride, and Titanium – Tungsten Surfaces", T. S. Cale and B. R. Rogers, presented during the MRS Fall 1998 Meeting, Nov 30 – Dec 4, 1998, Boston, MA.

"Effects of Process Variables on Film Morphology During TIBA Sourced Aluminum CVD", R. Jonnnalagdda, D. Yang, B. R. Rogers, T. S. Cale, R. F. Foster and J. T. Hillman, presented during the A.I.Ch.E 1998 Annual Meeting, Nov 15-20, 1998, Miama Beach, Florida.

"TEOS CVD Topography Simulation Using Surface CHEMKIN and EVOLVE", A. H. Labun, T. S. Cale, P. Ho, H. K. Moffat, M. E. Coltrin, presented during the 45th International AVS Symposium, Nov 2-6, 1998, Baltimore, MD.

"Programmed Rate CVD Protocols", D. Yang, J. J. Kristof, R. Jonnalagadda, B. R. Rogers, J. T. Hillman, R. F. Foster, and T. S. Cale, presented during the Symposium on Interconnect and Contact Metallization: Materials, Processes and Reliability, held during the 194th Meeting of the Electrochemical Society, November 1-6, 1998, Boston, MA.

"The Roles of "3d/2d" and "3d/2d" Topography Simulators in Process Development: Model Development and Process Integration", T. S. Cale, T. P. Merchant, and L. J. Borucki, presented during the Advanced Metallization Conference in 1998, October 6 – 8, 1998, Colorado Springs, CO.

"Factor and Interaction Effects on Relative Median Time Between Electromigration Failure for CVD Aluminum", D. Yang, R. Jonnalagadda, B. R. Rogers, J. T. Hillman, R. F. Foster, and T. S. Cale, presented during the Advanced Metallization Conference in 1998, October 6 – 8, 1998, Colorado Springs, CO.

"Mitigation of CMP Scratches on Polymer Coated Wafers", L. Y. Wang, T. S. Cale, B. Wang, Z. Li, and J. F. McDonald, presented during the Fifteenth International VLSI Multilevel Interconnection Conference, June 16-18, 1998, Santa Clara, CA.

(Invited) "Deposition Process Fundamentals", Timothy S. Cale, presented at the Arizona Chapter AVS 16th Annual Symposium, May 12, 1998, Phoenix, AZ.

"Texture and Surface Roughness of PRCVD Aluminum Films", R. Jonnalagadda, D. Yang, T. Cale, J. Hillman and R. Foster, presented during the International Conference on Metallurgical Coatings and Thin Films, April 27 – May 1, 1998, San Diego, California.

"Optimal Programmed Rate Chemical Vapor Deposition of Tungsten", J. J. Kristof, K. S. Tsakalis and T. S. Cale, presented during the International Conference on Metallurgical Coatings and Thin Films, April 27 – May 1, 1998, San Diego, California.

"Study of Factor and Interaction Effects During PRCVD of Al", D. Yang, R. Jonnalagadda, T. S. Cale, B. R. Rogers, J. T. Hillman and R. F. Foster, presented during the MRS 1998 Spring Meeting, April 13-17, 1998, San Francisco, California.

Selected Invited Seminars:

"Level Sets in Inerface Tracking", ASU, Tempe, AZ, June 5, 2009.

"Grain-Focused Models: Materials and Processes", T. S. Cale, University of Florida, Gainesville, FL, March 25, 2007.

"Towards a Virtual Wafer Fab", T. S. Cale, IBM, Fishkill, NY, Dec. 15, 2006.

"Grain Focused Simulations in Microelectronics", NIST, Gaithersburg, Md, May 15, 2006.

"Towards a Virtual Wafer Fab: BEOL Process and Materials Modeling and Simulation", IBM Research, Yorktown Heights, NY, April 5, 2006.

"Towards the Virtual Wafer Fab: Process and Materials Modeling", IBM/RPI CCNI Meeting, RPI, January 20, 2006.

"Topography and Materials Modeling", TEL, ANT, Albany, NY, Dec. 7, 2005.

"Multiscale Modeling and Simulation: Meters to Nanometers", Dept. of Chemical Engineering, University of Loisville, Louisville, KY, June 9, 2005.

"Materials Oriented Process Simulation", AMD, Dresden, Germany, March 9, 2005.

"Multiscale Modeling: A Grain Focus", Dept. of Materials Science, Queen Mary, Unversity of London, London, UK, February 4, 2005.

"Multiscale Modeling: A Grain Focus", Vanderbilt Institute for Nanoscale Science and Engineering, Vanderbilt University, Nashville, TN Jan. 31, 2005.

"Multiscale Process Modeling in Microelectronics", Institute of Physics, Chinese Academy of Sciences, Beijing, China, September 9, 2004.

"Some ALD and Thin Film Modeling Capabilities", Benet Laboratories, Watervilet, NY, April 8, 2004

"Propery-Oriented Multiscale Process Simulation", Synopsis Advisory Board Meeting, Washinton, DC, Dec. 9, 2003.

"A Parallel Level-set Environment for Nanoscale Topography Evolution", Synopsis, Sunnyvale, CA, Nov. 18, 2003.

”Parallel Level-set Environment for Nanoscale Topography Evolution”, Infineon, Munich, Germany, Aug., 2003.

“Multiscale Process and Materials Modeling in Microelectronics”, Univ. of Limerick, Limerick, Ireland, July, 2003.

“Multiscale Process and Materials Simulation in Microelectronics”, Univ. of Maryland, April, 2003.

“Integrated Multiscale, Multistep Process Simulation: ECD and CMP”, LSI Logic, Milpitas, CA, Dec. 2002.

“Thoughts on Process Simulation in Microelectronics”, LSI Logic, Gresham, Oregon, Nov. 2002.

“Integrated Multiscale Process Simulation in Microelectronics”, Wavefront, Yokohama, Japan.

“Integrated Multiscale Process Simulation in Microelectronics”, Fluent, Lebanon, NH, Sept, 2002.

“Focus Center – New York, Rensselaer: Interconnections for Gigascale Integration”, EV Group, Scharding, Austria, July, 2002.

“Integrated Multiscale Process Simulation in Microelectronics: Grain Scale to Equipment Scale”, University of Glasgow, Glasgow, Scotland, June, 2002.

"Multiscale Simulation: 3D Grain Formation and Evolution", Jiaotong University, Xian, China, June, 2002.

“EVOLVE, etc.”, CFDRC, Hunstville, Alabama, March, 2002.

“Integrated Multiscale Process Simulation in Microelectronics & Misc. Thoughts”, Dept. of Chemical Engineering, University of South Carolina, Columbia, South Carolina, March, 2002.

“Integrated Multiscale Process Simulation in Microelectronics: Grain Scale to Equipment Scale”, Foundation for Research & Technology-Hellas (FORTH), Heraklion, Crete, Greece, March, 2002.

“Integrated Multiscale Process Simulation in Microelectronics: Grain Scale to Equipment Scale”, Foundation for Research & Technology-Hellas (FORTH), Patras, Greece, March, 2002.

“Technology Transfer of EVOLVE”, ASML, Santa Cruz, CA, Feb., 2002.

“EVOLVE, etc.”, Avant!, Fremont, CA, Feb., 2002.

“Process Simulation: Atomic to Reator Scales”, Intel, Santa Clara, Nov. 30, 2001.

“Integrated Multiscale Process Simulation in Microelectronics: Equipment to Atomic Scales”, Hoseo Univeristy, Korea, November, 2001.

“Process Simulation: Feature Scale to Equipment Scale”, Samsung Corp., Korea, November, 2001.

“3D Platforms for ICs and Heterogeneous Systems”, IBM, Yorktown, August 2001

“Integrated Multiscale Process Simulation in Microelectronics”, Department of Chemical Engineering, University of Pennsylvania, September 2001.

“Focus Center – New York, Rensselaer: Interconnections for Gigascale Integration” and“Integrated Multiscale Process Simulation for Microelectronics: Equipment to Atomic Scales”, Chartered Semiconductor Manufacturing, Singapore, June 2001.

“Integrated Multiscale Process Simulation for Microelectronics: Equipment to Atomic Scales”, National University of Singapore, Singapore, June 2001

“Focus Center – New York, Rensselaer: Interconnections for Gigascale Integration” and“Integrated Multiscale Process Simulation for Microelectronics: Equipment to Atomic Scales”, IMEC, Leuven, Belgium, April 2001.

“Integrated Multiscale Process Simulation for Microelectronics: Equipment to Atomic Scales”, Vanderbilt University, Nashville, TN, March 2001.

“Integrated Multiscale Process Simulation”, Argonne National Lab, Argonne, IL, February 2001.

“Semiconductor Materials Processing”, Air Liquide, Chicago, IL, February 2001.

“Process Simulation in Microelectronics”, Chemnitz University, Chemnitz, Germany, September 2000.

“Integrated Multiscale Process Simulation in Microelectronics”, Delft University, July 2000.

“Integrated Multiscale Process Simulation”, Multi-scale Modeling Workshop, Institute for Mathematics and its Applications, University of Minnesota, June 2000.

“Predictive Process, Property, Performance Modeling for Microelectronics”, Gigascale Integration Research Center Workshop”, Stanford, March, 2000.

“Transport and Reaction Process Modeling: Examples in Semiconductor Materials Processing”, Department of Mechanical Engineering, Hong Kong Polytechnic University, September 1999.

“Transport and Reaction Process Modeling: Examples in Semiconductor Materials Processing”, Department of Chemical Engineering, Clarkson University, May 1999.

“Transport and Reaction Process Modeling: Examples in IC Fabrication”, Department of Chemical Engineering, Vanderbilt University, January 1999.

“Opportunities for Chemical Engineers in Microelectronics Research”, Advisory Council, Rensselaer Polytechnic Institute, May 1998.

“Topography Relevant Process Simulations”, Physics Department, State University of New York, Albany, April 1998.

“Topography Relevant Process Simulations”, Center for Advanced Interconnect Science and Technology, Rensselaer Polytechnic Institute, April 1998.

“Topography Relevant Process Simulations”, Department of Chemical Engineering, North Carolina State University, October 1997.

“Transport and Reaction Examples in Semiconductor Materials Processing”, Department of Chemical Engineering, Rensselaer Polytechnic Institute, August 1997.

“The Status of Multi-Scale Transport and Reaction Simulations”, DARPA Workshop on GMR Materials, University of Virginia, December 3, 1996.

“Transport and Reaction Simulation in Microelectronics”, University of Missouri, Rolla, October 23, 1996.

“The Status of Multi-Scale Transport and Reaction Simulations in Microelectronic Process Fabrication”, Michigan Technological Institute, October 4, 1996,

“Transport and Reaction during Deposition and Etch Processes”, Stanford TCAD Review, August 7-8, 1996.

“Transport and Reaction during Deposition, Etch and Thin Film Flow Processes”, Center for Solid State Electronics Research, Arizona State University, July 25, 1996.

“Topography Evolution During Deposition and Etch Processes”, NATO ASI on “Plasma Processing of Semiconductors”, at Chateau de Bonas, France, June 17-28, 1996.

“Introduction to Plasma Enhanced CVD”, NATO ASI on “Plasma Processing of Semiconductors”, at Chateau de Bonas, France, June 17-28, 1996.

“Applications of EVOLVE”, LSI Logic, Santa Clara, CA, February 12, 1996.

“Topography Evolution & Applications, NSF/DARPA Workshop on Computational Materials Science, held at the Institute for Mathematics and its Applications, Minneapolis, MN, January 23-26, 1996.

"Low Pressure Transport and Reaction in Features", Workshop on Modeling, Simulation and Database Needs in Plasma Processing", sponsored by the National Research Council, Washington, D.C., April 1-2, 1995.

"EVOLVE: Theory and Applications", Intel, Santa Clara, CA, March 19, 1995.

"Applications of EVOLVE to PVD Processes: Conformality and Composition", Meeting of the Northern California Thin Films Users Group of the American Vacuun Society, Palo Alto, CA, August 18, 1994.

"Physically Based Deposition and Etch Process Simulation", Korea-US IC Design Automation and Manufacturing Workshop, Taejon, South Korea, November 17-20, 1993.

"EVOLVE: ATool for Process Development", LSI Logic, Santa Clara, CA, September 17, 1993.

"EVOLVE: Applications in PVD", Varian, Palo Alto, CA, June, 1993.

"EVOLVE: A Tool for Kinetic Model Development", SEMATECH, Dallas, TX, May, 1993.

"Transport and Reaction at High Knudsen Numbers", University of Notre Dame, Department of Chemical Engineering, March, 1993

"Understanding Conformality: The Ballistic Transport and Reaction Model", AZ AVS Chapter's 10th Annual Symposium and Short Course Program, March, 1993.

"Applications of EVOLVE", SEMATECH, February, 1993.

"Transport and Reaction at High Knudsen Numbers", University of Texas, Department of Chemical Engineering, February, 1993

Research summary on "Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation Research Review, Rensselear Polytechnic Institute, Nov. 10-11, 1992.

"Semiconductor Materials Processing Research in Chemical Engineering", Third Annual Industrial Relations Meeting of the Center for Solid State Electronics Research at ASU, October 29-30, 1992.

"EVOLVE, A Low Pressure Deposition Process Simulator", Advanced Micro Devices, Santa Clara, CA, September, 23, 1992.

"Applications of EVOLVE", Sandia National Laboratory, Albuquerque, NM, August 21, 1992.

"TCAD at Arizona State University", SEMATECH, Austin, TX, April 16, 1992.

Research summary on "Process Development Tools for Single Wafer Reactors", Semiconductor Research Corporation Research Review, Rensselear Polytechnic Institute, Nov. 6-7, 1991.

"Semiconductor Materials Processing Research in Chemical Engineering", Third Annual Industrial Relations Meeting of the Center for Solid State Electronics Research at ASU, October 29-30, 1991.

"EVOLVE, a Simulator for Low Pressure Chemical Vapor Deposition and Etch Processes", Motorola, Advanced Technology Center, August 26 , 1991.

"Demonstration of a Simulator for Low Pressure Chemical Vapor Deposition Processes", SILVACO Data Systems, Santa Clara, CA, June 10, 1991.

"A Simulator for Low Pressure Deposition Processes", National Semiconductor, Santa Clara, CA, June 10, 1991.

"Insights into the Control of Semiconductor Processes", D. E. Rivera and T. S. Cale, Technology '90, Dec. 5-6, 1990.

"Unified Feature Scale Model for Deposition and Etch Processes (with Reference to Reactor Scale Models)", Intel Corp., Santa Clara, CA, Nov., 1990.

"Feature Scale Model for Ballistic Transport and Gas-Solid Reactions", Novellus Systems, Inc., San Jose, CA, Nov. 1990.

"Unified Feature Scale Model for Deposition and Etch Processes", Fall 1990 Industrial Relations Meeting of the Center for Solid State Electronics Research at ASU, Nov. 1990.

"A Modified Line-of-sight Model for Low Pressure Chemical Vapor Deposition", Motorola, Mesa, AZ, May, 1990.

"Desiccant Characterization Research at Arizona State University", Gas Research Institute, Chicago, IL, May, 1989.

"The Influence of Operating Conditions on Keyhole Formation in Plasma Silicon Oxynitride Passivation Layers", Intel, Chandler AZ, July, 1986.

"Applications of Catalytic Crystallite Thermometry", Chemical Engineering Department of the University of California at Los Angeles, January, 1986.

"Magnetic Crystallite Thermometry and its Applications", presented at Dow Chemical Co., Sept. 24, 1985.

"Nickel Crystallite Thermometry", BYU Catalysis Laboratory, Brigham Young University, May, 1984.

"Catalytic Crystallite Thermometry", Chemical Engineering Department of the University of Arizona, December, 1984.

"*In-Situ* Magnetic Characterization of Catalysts", Center for Solid State Sciences at ASU Fall 1982 Symposium Series.

Advisees:

In addition to the listed students below, I have mentored a number of post-doctoral research associates; including, Chaffra Awo-Affouda, Sang-Hwui Lee, Daniel N. Bentz, Jing Zhang, Jian Zhang, Yeon Ho Im, Jongwon Seok, Vinay Prasad, Daewon Yang, David Richards, Sofiane Soukane, Vadali Mahadev, Zongwu Tang, Rao Annapragada, Yu-Kwang Chang and Gerrit Leusink. I have also had the pleasure of mentoring two Research Professors: Jian Qiang Lu and Xiang-Yang Liu.

Student Theses and Dissertations:

Max Bloomfield, "A Computational Framework for Modeling Grain Structure Development in Three Dimensions", Ph.D., Chemical Engineering, RPI, July, 2007.

Joleyn Balch, "A study of the diameter Distribution of Thermally Evaporated Indium Metal Islands on Silicon Substrates", Chemical Engineering, RPI, July, 2007.

Ameet Kulkarni, "Adhesion of Ta to Porous MSQ", M.S., Chemical Engineering, RPI, December 2005.

Dae-lok Bae, "Copper Electrochemical Deposition on Modified Surfaces", Ph.D., Chemical Engineering, RPI, August 2004. (Co-advisor with J. Senkevich)

Yongchai Kwon, "Bonding for Hyperintegration through Wafer Stacking", Ph.D., Chemical Engineering, RPI, August 2003. (Co-advisor with R. Gutmann)

Pushkar Jain, "Pulsed DC Reactively Coupled Tantalum Oxide Thin Films for Embedded Capacitors", Ph.D., Chemical Engineering, RPI, May 2003. (Co-advisor with G. Rymaszewski.)

Vinay Bhagwat, Comparison of High Frequency and DC Characteristics of Different Dielectrics Based Thin Films for Embedded Capacitor Applications", M.S., Chemical Engineering, RPI, December 2002. (Co-advisor with G. Rymaszewski.)

Jasbir Juneja, "Effect of Substrate Temperature on the Dielectric Properties of Tantalum Oxide Films Deposited by Reactive Pulsed Magnetron Sputtering", M.S., Chemical Engineering, RPI, December 2002. (Co-advisor with G. Rymaszewski.)

Andrew Kim, "Multiscale CMP Modeling", Ph.D., Mechanical Engineering, RPI, May 2002. (Co-advisor with J. Tichy)

Shrinivas Shetty, "Lowering CVD Copper Film Resistivities By Using Hydrogen", Chemical Engineering, M.S. RPI, August 2000.

John Kristof, "Optimal Programmed Rate Chemical Vapor Deposition of Tungsten", Electrical Engineering, M.S. ASU, May 2000. (Co-advisor with K. Tsakalis.)

Daewon Yang, "Nucleation Studies of Aluminum CVD", Chemical Engineering, Ph.D., RPI, December, 1999.

Rexford Brian Clevinger, "Lead-Tin Oxide Surface Removal From C4 Bumps", Chemical Engineering, M.S., ASU, May 1999.

Veera Mohan K. Gunturu, “Installation and Characterization of a Dual Frequency Plasma Etcher”, Chemical Engineering, M. S., ASU, May 1999.

Lei Xu, “Kinetics and Conformality of Films Deposited from FTES”, Chemical Engineering, M.S., ASU, May, 1998.

Chandrashekar Srinivasa-Murthy, “Non-Uniformity in Chemical Mechanical Polishing Processes: An Effect of Stress”, Chemical Engineering, M.S., ASU, December 1997. (Co-advisor is S. Beaudoin)

Patrick Zilaro, “EVOLVE for Solid State Transport and Reaction”, Chemical Engineering, M.S., ASU, May, 1999.

Raj Jonnalagadda, “Aluminum CVD in a Rotating Disc Reactor”, Chemical Engineering, M.S., ASU, December 1997.

Surasit Chungpaiboonpatana, “Characterization of Bump Processing”, Chemical Engineering, M.S., ASU, August 1997. (Co-advisor is S. Beaudoin)

Frank Myers, "Step Coverage of Silicon Dioxide Films Using Dual Frequency PETEOS", Chemical Engineering, Ph.D., ASU, May, 1997.

Dapeng Wang, “Von Mises Stresses in CMP Processes”, Chemical Engineering, M.S., ASU, May, 1997. (Co-advisor is S. Beaudoin)

Moneth Virmani, “Remote Microwave Plasma Enhanced Chemical Vapor Deposition of Fluorine Doped Silicon Dioxide from FASi-4", Chemical Engineering, M.S., ASU, May, 1996.

Kathryn Tracy, "Programmed Rate Chemical Vapor Deposition of Tungsten", Materials Science and Engineering, M.S., ASU, May, 1996.

Ashok Challa, "Microstructure Evolution During the Early Stages of Deposition: Monte Carlo Simulations", Science and Engineering of Materials, Ph.D. ASU, May, 1996.

Hung Liao, "Simulation of Deposition and Reflow Processes", Chemical Engineering, Ph.D., ASU, December, 1995.

Gaddam Sreedhar, “Integration Studies of Via Etch and Aluminum Sputter Deposition Steps", Chemical Engineering, M. S., ASU, December, 1995.

Satnam S. Doad, "Evaluation of TIBA as an Al CVD Source", Chemical Engineering, M.S., ASU, December, 1995.

Ganesh Rajagopalan, "Novel Structure for Evaluating the Electromigration Reliability of Aluminum-Copper Interconnects", Chemical Engineering, M. S., ASU, August, 1995.

Zhou Lin, "Transport Through Collimators", Chemical Engineering, M. S., ASU, December, 1995.

Rahul Bammi, "Development of a Gate Metal Etch Process for GaAs Wafers", Chemical Engineering, M. S., ASU, May, 1994.

Manjula Ramaswami, "Dual Frequency Plasma Sheath Models", Chemical Engineering, M. S., ASU, May, 1994.

Donald S. Taylor, "Simulation and Experimental Studies of Sputter Deposited Films", Electrical Engineering, M.S., ASU, May, 1994.

Robert H. Cavett, "A New Approach to the Solution of Nonlinear Equations", Chemical Engineering, Ph.D., ASU, August, 1993.

Manoj K. Jain, "Maximizing Step Coverage at High Throughput During Low Pressure Deposition Processes", Chemical Engineering, Ph.D., ASU, December, 1992.

Jung-Hwan Park, "Combined LPCVD Single Wafer Reactor and Feature Scale Model", Chemical Engineering, Ph.D., ASU, August, 1992.

T.-Q. Phan, "Ballistic Transport-Reaction Model for Rectangular Vias", Chemical Engineering, M.S., ASU, May, 1992.

Kenneth W.-K. Tsui, "Design, Construction and Testing of a Remote Microwave Plasma Deposition System", Chemical Engineering, M.S., ASU, May, 1992 (Co-advisor with G. B. Raupp).

Cynthia Pillote, "Deposition of Hard Carbon Films for Hard Disk Protection Layers", Materials Science and Engineering, M.S., ASU, December, 1991.

Meenakshi Govil, "Fundamental Feature Scale Model for LPCVD in Features of Circular Cross-section", Chemical Engineering, M.S., ASU, August 1991.

Todd H. Gandy, "Fundamental Feature Scale Model for Deposition and Etchback in Trenches of Symmetric Cross-section", Chemical Engineering, M.S., ASU, May 1991.

Chul-Kun Cho, "Catalytic Reactor Control Using Nickel Crystallite Thermometry", Chemical Engineering, Ph.D., ASU, 1990.

Sherif Aly Mohamed, "A Fundamental Model for Transport and Reaction in a Single Catalyst Pore", Chemical Engineering, M.S., ASU, 1990.

Bridget R. Rogers, "Localized Corrosion of Al-1.5%Cu Thin Films Exposed to Photoresist Developing Solutions", Chemical Engineering, M.S., ASU, 1990.

John A. Merson, "Magnetically Determined Axial Solid Temperature Profiles in Packed Bed Catalytic Reactors", Chemical Engineering, Ph.D., ASU, 1990

P. K. Sinha, "Internal Gettering of Iron and Nickel in Silicon", Chemical Engineering, Ph.D., ASU, 1988.

Hepburn Ingham. "Catalytic Cracking Detector for Gas Chromatography, Chemical Engineering, M.S., ASU, 1989. (Co-advisor with V. E. Sater)

Douglas K. Ludlow, "The Application of Nickel Crystallite Thermometry to Low Reynolds Number Interphase Heat Transfer", Chemical Engineering, Ph.D., ASU, 1986.

Janet M. Lawson, "The Model Dependency of the Apparent Nusselt Number in Packed Beds at Low Reynolds Numbers", Chemical Engineering, M.S., ASU, 1986.

Philip H. Williams, "The Effect of Rapid Calcination on a Cobalt-Thoria/Alumina Fischer-Tropsch Catalyst", Chemical Engineering, M.S., ASU, 1985.