

Curriculum Vitae
ANTHONY J. MUSCAT
Department of Chemical and Environmental Engineering
Harshbarger Bldg., Room 134
1133 E. James Rogers Way
University of Arizona
Tucson, AZ 85721
Tel: 520-626-6580 E-mail: muscat@erc.arizona.edu

EDUCATION

2004-05 Sabbatical Research, Interuniversity MicroElectronics Center (IMEC) and Department of Metallurgy and Materials Engineering, Katholic University, Leuven, Belgium
1993-95 Postdoctoral Research Associate, Department of Chemical Engineering, MIT, Cambridge, MA, Professor Herb H. Sawin, mentor
1993 Ph.D., Chemical Engineering, Stanford University, Stanford, CA. Dissertation title: "The Effects of Sulfur on the Thermodynamics and Kinetics of Adsorbed CO Overlayers on Ni(100)," Professor Robert J. Madix, advisor
1990-93 Postdoctoral Research Associate, Department of Physics, University of Laval, Quebec City, Quebec, Canada, Professor Denis Roy, mentor
1987-88 Internship, IBM Almaden Research Center, San Jose, CA, Dr. Helmut Poppa, mentor
1983 M.S. Chemical Engineering, Stanford University, Stanford, CA
1982 B.S. Chemical Engineering, University of California, Davis, Davis CA

EMPLOYMENT

2009-present Professor of Chemical Engineering, University of Arizona, Tucson, AZ
2003-2009 Associate Professor of Chemical Engineering, Univ. of Arizona, Tucson, AZ
1998-2003 Assistant Professor of Chemical Engineering, Univ. of Arizona, Tucson, AZ
1995-1997 Assistant Professor of Chemical Engineering, San Jose State Univ., San Jose, CA

HONORS AND AWARDS

2013 University of Arizona Honors College Five Star Faculty Finalist
2009-2012 Appointed to APS Professorship in the College of Engineering
2014 Excellence at the Student Interface, Faculty Award, Department of Chemical and Environmental Engineering, University of Arizona, Tucson, AZ. Also awarded in 2007, 2004, 2001, 1999, 1998
2005 da Vinci Circle Fellowship UA College of Engineering
2003 Scientific American 50 Technology Leaders, Policy Leader in Chemicals and Materials Science
1998 Professor of the Year, Tau Beta Pi, University of Arizona, Tucson, AZ.
1997 National Science Foundation (NSF) CAREER Award

SERVICE (2004-2012)

Outreach:

University of Arizona/NASA Space Grant Science Speakers Program 2004-2008

Elementary school classroom science presentations, Catalina Foothills and Tucson Unified School Districts (1-2/yr) 2004-2008
Tucson Science Fun Festival, Tucson Convention Center, Organization Committee 2004 and Presenter 2004-2008

Departmental Committees:

Curriculum (Chair), 2008-2009
Planning, 2007-2009
Undergraduate Studies, 2004-2009, 2011-2012
Freshman class advisor, 2004-2009, 2012-2014
Faculty evaluation, 2009
Faculty Status (Promotion and Tenure) 2012
Graduate Studies, 2013-14
SRC/Sematech Engineering Research Center for Environmentally Benign Semiconductor Manufacturing, Teleseminar Series Coordinator (biweekly), 2004-2009

College Committees:

da Vinci Circle Fellowship, 2006-2014
Faculty Status (Promotion and Tenure), 2011-2013
Engineering Innovation Building Executive Committee, 2012-2013

University Service:

Office of Nationally Competitive Scholarships Advisory Board 2013-2014
Institutional Chemical Safety, 2007-2009
NSF/SRC/Sematech Engineering Research Center for Environmentally Benign Semiconductor Manufacturing, Thrust B, Co-leader and Annual Review Organization Committee, 2004-2008
Churchhill, Scholarship Committee, 2010-2011
Nanofabrication and Processing Laboratory (Chair), 2010-2011

Service to Profession:

Professional Journal

Associate Editor, Transactions on Semiconductor Manufacturing, Institute of Electrical and Electronics Engineers (IEEE), 2008-2014 (served as Editor in Chief, Summer 2012).

Professional Organizations

Executive Committee (elected), Electronic Materials and Processing Division (EMPD), American Vacuum Society (AVS) 2010-2011.
Program Vice-chair (elected), Electronic Materials and Processing Division (EMPD), American Vacuum Society (AVS) 2011.
Program Chair (elected), Electronic Materials and Processing Division (EMPD), American Vacuum Society (AVS) 2012.
Executive Committee (elected), New Mexico Chapter, American Vacuum Society (AVS) 2012.
International Symposium Program Vice-Chair 2013-2014

Industry Advisory

International Technology Roadmap for Semiconductors (ITRS), Front End Processes, Surface Preparation Technology Working Group, 2004-2010.

Meeting organization

American Vacuum Society International Conference on Microelectronics and Interfaces Conference, Novel Processes and Devices Session organizer and chair, 2004-05.
Sematech Surface Preparation and Cleaning Conference, Technical Co-chair, 2008-2011.
American Vacuum Society International Symposium, Electronic Materials & Processing Division Program Chair, 2012.

Grant Review Panels

NSF, 2000 to present.

Membership in Professional Societies

American Society for the Advancement of Science, 1985 to present.
Sigma Xi, The Scientific Research Society, 1994 to present.
Materials Research Society (MRS), 1995 to present.
Electrochemical Society (ECS), 1995 to present.
American Vacuum Society (AVS), 1995 to present.
American Society for Engineering Education (ASEE), 1995 to present.
American Chemical Society (ACS), 1996 to present.
American Institute of Chemical Engineers (AIChE), 1995 to 1998, 2008 to present.
Institute of Electrical and Electronics Engineers (IEEE), 2011 to present.

TEACHING EXPERIENCE

Chemical & Environmental Engineering (CHEE)
CHEE 202 – Elements of Chemical Engineering II
CHEE 304 – Chemical Engineering Units Operations Laboratory
CHEE 326 – Chemical and Physical Equilibrium
CHEE 402 – Intermediate Engineering Analysis
CHEE 413 – Process Control and Simulation
CHEE 436 – Engineering Innovation
CHEE 437/537 – Surface Chemistry and Physics
CHEE 420 – Chemical Reaction Engineering
CHEE 506 – Advanced Chemical Engineering Thermodynamics

GRADUATE STUDENTS

Casey Finstad, PhD Chemical Engineering 2004, Texas Instruments/Sandia National Laboratory
Sarah Perry, MS Chemical Engineering 2005, University of Illinois Ph.D. candidate
Bo Xie, PhD Chemical Engineering 2005, Applied Materials
Michael Durando, MS Chemical Engineering 2005, Boston University M.D./Ph.D. candidate
Hongbin Zhu, PhD Chemical Engineering 2005, Micron
Gerardo Montano, PhD Chemical Engineering 2006, Intel
Adam Thorsness, PhD Chemical Engineering 2006, Lam Research
Shariq Shiddiqui, MS Chemical Engineering 2008, Intel

Rachel Morrish, PhD Chemical Engineering 2009, Colorado School of Mines, Assistant Professor

Fee Li Lie, PhD Chemical Engineering 2011 – IBM

Rahul Jain, PhD candidate Chemical Engineering 2012 – Intel

Bernal Granados, PhD candidate Chemical Engineering 2012 – Intel

Feng Jiang, PhD student Chemical Engineering 2013 – BOE

Shawn Miller, MS student Optical Sciences – current

Amy Ng, MS student Materials Science & Engineering – current

Pablo Macheno, PhD student, Chemical Engineering – current

Yissel Contreras, PhD student Chemical Engineering – current

Armando Suárez, PhD student Electrical Engineering – current

Adam Hinckley, PhD student, Materials Science & Engineering – current

Lance Hubbard, PhD student, Chemical Engineering – current

Stephen Purdy, MS student, Materials Science & Engineering – current

Jefferson Lee, , MS student, Chemical Engineering – current

Stacy Heslop, PhD student, Chemistry – current

Lauren Peckler, PhD student, Chemical Engineering – current

Jimmy Hackett, PhD student, Chemical Engineering – current

POSTDOCTORAL RESEARCH ASSOCIATES

Dr. Zhengtao Deng – 2007-2009

Dr. Casey Finstad – 2009-2011

Dr. Fernando Javier Torres, Assistant Professor, University of Quito, Quito, Ecuador, 2008

Dr. Gary Fleming, New Zealand, 2007-08

PUBLICATIONS (*denotes work done as a graduate student)

Refereed Journal Articles

1. K. R. Krovvidi, A. Muscat, P. Stroeve, and E. Ruckenstein, "Transport of monomer surfactant molecules and hindered diffusion of micelles through porous membranes," *J. Colloid and Interface Science* 100(2), 497 (1984).
2. *N. Vasquez, A. J. Muscat, and R. J. Madix, "The effect of site distribution on desorption kinetics: CO on Ni(100)," *Surface Science* 302, 83 (1994).
3. A. J. Muscat, A. Rjeb, and D. Roy, "Oxidation of Si(111)7x7 using alkali metal atoms: evidence for local promotion mechanisms," *Surface Science Letters* 302, L256 (1994).
4. *N. Vasquez, A. J. Muscat, and R. J. Madix, "Coverage and site distribution effects in the desorption of CO from S-covered Ni(100)," *Surface Science* 339, 29 (1995).
5. *A. J. Muscat and R. J. Madix, "How annealing affects the desorption kinetics of CO on Ni(100)," *J. Physical Chemistry* 100, 9807 (1996).
6. A. J. Muscat, E. L. Allen, E. D. H. Green, and L. S. Vanasupa, "Interdisciplinary teaching and learning in a semiconductor processing course," *J. Engineering Education* 87, 413 (1998).
7. A. J. Muscat, A. G. Thorsness, and G. Montaña-Miranda, "Characterization of residues formed by anhydrous HF etching of doped oxides," *J. Vacuum Science & Technology A*. 19(4), 1854 (2001).
8. C. C. Finstad, M. J. Schabel, and A. J. Muscat, "Multiple sample manipulator with five degrees of motional freedom for angle-resolved spectroscopy in ultrahigh vacuum," *Review of Scientific Instruments*, 74(2) 1036-1042 (2003).
9. M. J. Schabel, T. Peterson, and A. J. Muscat, "Macromolecule formation in low density CF₄ plasmas: the influence of H₂," *Journal of Applied Physics*, 93(3), 1389-1402 (2003).
10. A. G. Thorsness and A. J. Muscat, "Moisture absorption and reaction in borophosphosilicate glass thin films," *Journal of the Electrochemical Society*, 150(12), F219-F228 (2003).
11. B. Xie and A. J. Muscat, "Silylation of porous methylsilsesquioxane films in supercritical carbon dioxide," *Microelectronic Engineering*, 76, 52-59 (2004).
12. B. Xie and A. J. Muscat, "Dehydration of porous MSQ (p-MSQ) using supercritical carbon dioxide and alcohol cosolvents," *IEEE Transactions on Semiconductor Manufacturing*, 17, 544-553 (2004).
13. B. Xie, L. Choate, and A. J. Muscat, "Repair and capping of porous MSQ films using chlorosilanes and supercritical CO₂," *Microelectronic Engineering* 80, 349-352 (2005).
14. B. Xie, G. Montaña-Miranda, C. C. Finstad and A. J. Muscat, "Native oxide removal from SiGe using mixtures of HF and water delivered by aqueous, gas, and supercritical CO₂ processes," *Materials Science in Semiconductor Processing*, 8(1-3), 231-237 (2005).
15. B. Xie, C. C. Finstad, and A. J. Muscat, "Removal of copper from silicon surfaces using hexafluoroacetylacetone (hfacH) dissolved in supercritical carbon dioxide," *Chemistry of Materials* 17, 1753-1764 (2005).

16. B. Xie and A. J. Muscat, "The restoration of porous methylsilsequioxane (p-MSQ) films using trimethylhalosilanes dissolved in supercritical carbon dioxide," *Microelectronic Engineering*, 82, 434-440 (2005).
17. C. C. Finstad, G. Montano-Miranda, A. G. Thorsness, A. J. Muscat, "Gas phase preparation and analysis of semiconductor surfaces in a clustered reactor apparatus," *Review of Scientific Instruments* 77(9), 093907/1-093907/11 (2006).
18. C. C. Finstad, A. G. Thorsness, A. J. Muscat, "The mechanism of amine formation on Si(100) activated with chlorine atoms," *Surface Science*, 600(17), 3363-3374 (2006); *List of Top 25 Papers downloaded in Surface Science that month*; see the perspective by R.J. Hamers, "Passivation and activation: How do monovalent atoms modify the reactivity of silicon surfaces?" *Surface Science* 600 (17) (2006) 3361-3362.
19. R. M. Morrish, A. Witvrou, A. J. Muscat, "Kinetic to transport-limited anhydrous HF etching of silicon oxynitride films in supercritical CO₂," *J. Phys. Chem. C* 111, 15251-15257 (2007).
20. Z. Deng, F. Tang, A. J. Muscat, "Strong blue photoluminescence from single-crystalline bismuth oxychloride nanoplates," *Nanotechnology* 19, 295705 (2008).
21. Z. Deng, Z. Bao, L. Cao, D. Chen, F. Tang, F. Wang, C. Liu, B. Zou, A. J. Muscat, "Spherical hexagonal tellurium nanocrystals: fabrication and size-dependent structural phase transition at high pressure," *Nanotechnology* 19, 045707 (2008).
22. F. L. Lie, W. Rachmady, A. J. Muscat, "A comparison of liquid and gas phase surface preparation of III-V compound semiconductors for atomic layer deposition," *Microelectronic Engineering* 86, 122-127 (2009), doi: 10.1016/j.mee.2008.07.004.
23. Z. Deng, B. Peng, D. Chen, F. Tang, A. J. Muscat, "A new route to self-assembled tin dioxide nanospheres: fabrication and characterization," *Langmuir*, 24 (19), 11089–11095 (2008).
24. E. Vyhmeister, A.J. Muscat, D. Suleiman, L. A. Estévez, "High pressure phase equilibria for chlorosilane + carbon dioxide mixtures," *Fluid Phase Equilibria*, 270, 121–128 (2008).
25. T. K. Moreno, W. Zimmt, N. Odegaard, R. A. Turner, B. Xie, A. J. Muscat, M. R. Riley, "Supercritical carbon dioxide (scCO₂) extraction of pesticides from simulated museum artifacts," *Journal of the American Institute for Conservation*, in the press.
26. M. Durando, R. Morrish, A. J. Muscat, "Kinetics and mechanism for the reaction of hexafluoroacetylacetone with CuO in supercritical carbon dioxide," *Journal of the American Chemical Society*, 130 (49) 16659–16668 (2008), DOI: 10.1021/ja8050662.
27. Z. Deng, F.-L. Lie, S. Shen, I. Ghosh, M. Mansuripur, A. J. Muscat, "Water-based route to ligand-selective synthesis of ZnSe and Cd-doped ZnSe quantum dots with tunable ultraviolet A to blue photoluminescence," *Langmuir*, 25 (1), 434–442 (2009).
28. Z. Deng, M. Mansuripur, A. J. Muscat, "New method to single-crystal micrometer-sized ultra-thin silver nanosheets: synthesis and characterization," *J. Phys. Chem. C*, 113 (3), 867–873 (2009).
29. Z. Deng, D. Chen, F. Tang, J. Ren, A. J. Muscat, "Synthesis and purple-blue emission of antimony trioxide single-crystalline nanobelts with elliptical cross section," *Nano Research* 2, 151-160 (2009), DOI 10.1007/s12274-009-9014-y.

30. Z. Deng, M. Mansuripur, A. J. Muscat, "Simple Colloidal Synthesis of Single-Crystal Sb–Se–S Nanotubes with Composition Dependent Band-Gap Energy in the Near-Infrared," *Nano Letters* 9(5), 2015-2020 (2009), DOI: 10.1021/nl9002816.
31. Z. Deng, M. Mansuripur, A. J. Muscat, "Synthesis of two-dimensional single-crystal berzelianite nanosheets and nanoplates with near-infrared optical absorption," *J. Mater. Chem.* 19, 6201 - 6206 (2009), DOI: 10.1039/b907452j.
32. R. Morrish and A. J. Muscat, "Nanoporous silver with controllable optical properties formed by chemical dealloying in supercritical CO₂," *Chemistry of Materials* 21, 3865-3870 (2009).
33. F. L. Lie, W. Rachmady, A. J. Muscat, "In_{0.53}Ga_{0.47}As(100) native oxide removal by liquid and gas phase HF/H₂O chemistries," *Microelectronic Eng.* 87, 1656-1660 (2010).
34. B. Imangholi, F. L. Lie, H. G. Parks, A. J. Muscat, "Effect of deep-level defects on surface recombination velocity at the interface between silicon and dielectric films," *IEEE Trans. Elec. Dev.* 57(4), 877-889 (2010).
35. R. Morrish, K. Dorame, A. J. Muscat, "Formation of nanoporous Au by dealloying AuCu thin films in HNO₃," *Scripta Materialia*, 64(9), 856-859 (2011). DOI: 10.1016/j.scriptamat.2011.01.021.
36. F. L. Lie, A. J. Muscat, "Controlled oxide removal and surface morphology on InSb(100) using gas phase HF/H₂O," *J. Phys. Chem. C* 115(15), 7440-7449 (2011). DOI: 10.1021/jp110151y.
37. B. Granados-Alpizar and A. J. Muscat, "Surface Reactions of TiCl₄ and Al(CH₃)₃ on GaAs(100) During the First Half-Cycle of Atomic Layer Deposition," *Surf. Sci.* 605, 1243-1248 (2011). DOI:10.1016/j.susc.2011.04.009.
38. F. L. Lie, W. Rachmady, A. J. Muscat, "Oxide Removal and Selective Etching of In from InSb(100) with TiCl₄," *J. Phys. Chem. C* 115(40), 19733–19740 (2011). DOI: 10.1021/jp204408n.
39. F. Jiang and A. J. Muscat, "Ligand-Controlled Growth of ZnSe Quantum Dots in Water during Ostwald Ripening," *Langmuir*, 28(36), 12931–12940 (2012), DOI: 10.1021/la301186n.
40. B. Granados and A. J. Muscat, "Interfacial Chemistry of HF-treated In_{0.53}Ga_{0.47}As(100) During Atomic Layer Deposition of Aluminum Oxide," *J. Vac. Sci. Technol. A.*, 31, 01A143 (2013), DOI: <http://dx.doi.org/10.1116/1.4770288>.
41. R. Morrish and A. J. Muscat, "Multiphase AgCu Thin Films in Supercritical CO₂," *J. Phys. Chem. C*, 117 (23), 12071–12077 (2013), <http://dx.doi.org/10.1021/jp312651b>.
42. E. Vyhmeister, H. Valdés-González, A. J. Muscat, D. Suleiman, and L. A. Estévez. "Surface Modification of Porous Silicon-Based Films Using Dichlorosilanes Dissolved in Supercritical Carbon Dioxide," *Ind. & Eng. Chem. Res.* 52 (13), 4762-4771 (2013), <http://dx.doi.org/10.1021/ie302686e>.
43. F. Jiang and A. J. Muscat, "Solvent-Triggered Self-Assembly of CdTe Quantum Dots into Flat Ribbons" *J. Phys. Chem. C*, 117 (42), 22069–22078 (2013), <http://dx.doi.org/10.1021/jp406795t>.

44. C. C. Finstad and A. J. Muscat, "Ammonia Photodissociation Promoted by Si(100)," *J. Phys. Chem. A*, (2014), <http://dx.doi.org/10.1021/jp408543e>.

BOOK CHAPTERS

1. J. W. Butterbaugh, A. J. Muscat, "Gas-phase Wafer Cleaning Technology," in *Handbook of Silicon Wafer Cleaning Technology*, 2nd ed., K. A. Reinhardt and W. Kern, Eds.; William Andrew Inc.: Norwich, NY, 2008, pp. 269-353.
2. W. Zimmt, N. Odegaard, T. K. Moreno, R. A. Turner, M. R. Riley, B. Xie, A. J. Muscat, "Pesticide Extraction Studies Using Supercritical Carbon Dioxide," in "Pesticide Mitigation in Museum Collections: Science in Conservation." A.E.Charola and R.J. Koestler, Eds., *Smithsonian Contributions to Museum Conservation No.1*, Smithsonian Institution Scholarly Press, Washington, DC. 2010, pp. 51-57.

PATENTS

1. A. Witvrouw, C. Van Hoof, J. Fransaer, J.P. Cellis, A. J. Muscat, R. C. Hellin-Rico, "Method for encapsulating a device in a microcavity," U.S. Patent: 2008/0135998 A1 (2008).
2. E. Shero, M. Verghese, A. Muscat, S. Miller: Reactive site deactivation against vapor deposition. ASM America. August 18, 2011: U.S. patent 8,293,658.
3. [disclosure] A. J. Muscat and L. R. Hubbard, "Electrostatic Coating With Metallic Nanoparticles By Intrinsic Particle To Surface Interaction," Provisional Patent Application 61/910,777, U.S. Patent Office, filed December 2, 2013.

PROCEEDINGS

1. S. Lawing, A. J. Muscat, H. H. Sawin, J. W. Butterbaugh, "UV/Cl₂ etching and cleaning of wafer surfaces," R. E. Novak and J. Ruzylo, eds. (*Electrochemical Society Proceedings*, Pennington, NJ) 95-20, 150 (1995).
1. A. J. Muscat, A. S. Lawing, H. H. Sawin, J. Butterbaugh, D. Syverson, F. Hiatt, "Characterization of silicon oxide etching in gas phase HF/vapor mixtures," R. E. Novak and J. Ruzylo, eds. (*Electrochemical Society Proceedings*, Pennington, NJ) 95-20, 371 (1995).
2. A. J. Muscat, E. L. Allen, E. D. H. Green, L. S. Vanasupa, "The start-up company approach to teaching semiconductor processing," *Proceedings of the American Society of Engineering Education Conference*, Milwaukee, WI (1997).
3. A. J. Muscat, "Raising the level of questioning in the chemical engineering curriculum," *Proceedings of the American Society of Engineering Education Conference*, Charlotte, NC (1999).
4. A. J. Muscat, A. G. Thorsness, G. Montaño-Miranda, Casey C. Finstad, "A surface chemistry approach to the development of gas phase wafer cleaning processes," J. Ruzylo, T. Hattori, R. L. Opila, and R. E. Novak, eds. (*Electrochemical Society Proceedings*, Pennington, NJ) 2001-26, 221 (2001).
5. C. C. Finstad, A. J. Muscat, "Surface preparation for high-k gate stacks," 10th International Symposium on Cleaning Technology in Semiconductor Device Manufacturing, Orlando, FL, 2003, J. Ruzylo, T. Hattori, R. L. Opila, and R. E. Novak, eds. (*Electrochemical Society Proceedings*, Pennington, NJ), PV 2003-26, 86-92 (2003).

6. B. Xie, A. J. Muscat, "Water removal and repair of porous ultra low-k films using supercritical CO₂," 10th International Symposium on Cleaning Technology in Semiconductor Device Manufacturing, Orlando, FL, 2003, J. Ruzyllo, T. Hattori, R. L. Opila, and R. E. Novak, eds. (Electrochemical Society Proceedings, Pennington, NJ), PV 2003-26, 279-288 (2003).
7. G. Montaña-Miranda, A. J. Muscat, "Gas phase HF/vapor etching of thermal silicon dioxide films," *Diffusion and Defect Data Part B Solid State Phenomena*, 92, 207-10 (2003).
8. B. Xie and A. J. Muscat, "Repair of porous methylsilsesquioxane films using supercritical carbon dioxide," *Materials Research Society Symposium Proceedings* 812, 13-18 (2004).
9. B. Xie and A. J. Muscat, "Water removal and repair of porous ultra low-k films using supercritical CO₂," *Electrochemical Society Proceedings* 2003-26, 279-288 (2004).
10. B. Xie and A. J. Muscat, "Dehydration of porous carbon doped oxide ultra low-k films using supercritical CO₂," *Proc. AVS 5th International Conference on Microelectronics and Interfaces (ICMI)*, Eds. T. S. Cale and C.T. Gabriel, 209-211 (2004).
11. C. C. Finstad and A. J. Muscat, "Atomic layer deposition of silicon nitride barrier layer for self-aligned gate stack," *Electrochemical Society Proceedings* 2003-26, 86-92 (2004).
12. B. Xie and A. J. Muscat, "Repair of porous methyl-substituted silicon dioxide films using supercritical CO₂," *ECS Transactions*, Eds. J. Ruzyllo, T. Hattori, and R.E. Novak, Electrochemical Society, K2, 293-300 (2005).
13. B. Xie, A.J. Muscat, E. Busch, and T. Rhoad, "The Reaction of octyldimethylchlorosilane and supercritical CO₂ mixtures with porous methylsilsesquioxane thin films," *Advanced Metallization Conference 2004*, Eds. D. Erb, P. Ramm, K. Masu, and A. Osaki, Materials Research Society, 475-479 (2005).
14. A.G. Thorsness and A.J. Muscat "Interfacial layer formation on silicon by halogen activation," *Cleaning Technology in Semiconductor Device Manufacturing IX*. ECS Transactions Vol. 1, no. 3, 309-316 (2005).
15. C. C. Finstad, A. J. Muscat, "UV activated surface preparation of silicon for high-k dielectric deposition," *Solid State Phenomena* 103-104, 7-10 (2005).
16. B. Xie, A. J. Muscat, "Repair of porous MSQ (p-MSQ) films using monochlorosilanes dissolved in supercritical CO₂," *Solid State Phenomena* 103-104, 323-326 (2005).
17. G. Montaña-Miranda and A. J. Muscat, "Etching of silicon dioxide with gas phase HF and water: initiation, bulk etching, and termination," *Solid State Phenomena* 134, 3-6 (2008).
18. W. Zimmt, N. Odegaard, T. K. Moreno, R. A. Turner, M. R. Riley, B. Xie, A. J. Muscat, "Pesticide extraction studies using supercritical carbon dioxide (scCO₂). Pesticide Mitigation in Museum Collections. Edited by R. J. Koestler and A. E. Charola, Washington D.C.: Smithsonian Institution Press.
19. P. Mancheno-Posso and A. J. Muscat, "Self-assembly of Alkanethiols to Protect GaAs(100)," *Semiconductor Cleaning Science and Technology* 13, *Electrochemical Society Transactions* (2013).

SCHOLARLY PRESENTATIONS (2004-13)

INVITED

1. A. J. Muscat, "Process chemistry that occurs at solid surfaces that advances device performance while minimizing the environmental impact of manufacturing," American Chemical Society (ACS), Southeastern Regional Meeting, Raleigh, NC, November 13, 2004.
2. A. J. Muscat, FSI Knowledge Services Seminars Series, "Short course: fundamentals of surface characterization," May 23, 25, June 1, 6, 8, 2006.
3. A. J. Muscat, "Chemistry on semiconductor surfaces in supercritical CO₂," Texas Instruments, Dallas, TX, January 10, 2006.
4. A. J. Muscat, "Environmentally sustainable process chemistry at solid surfaces using scCO₂," American Chemical Society (ACS) 61st Northwest Regional Meeting, Reno, Nevada, June 27, 2006.
5. A. J. Muscat, "Surface preparation for extending CMOS," 8th International Symposium of Ultra Clean Processing of Semiconductor Surfaces (UCPSS), Antwerp, Belgium, September 18, 2006.
6. A. J. Muscat, "Physics and chemistry at semiconductor interfaces," University of Pavia, Pavia, Italy, May 31, 2007.
7. S. Siddiqui, A. J. Muscat, "Surface preparation of germanium using halogen chemistries," Interuniversity Microelectronics Center (IMEC), Leuven, Belgium, June 14, 2007.
8. A. Muscat, "Interface Preparation for High Mobility Substrates," American Institute of Chemical Engineers (AIChE) National Meeting, Electronics and Photonics (08e) #183 - Topics in Plasma Science and Thin Film Applications III - in Honor of Herbert H. Sawin, Philadelphia, PA, November 17, 2008.
9. A. Muscat, "Semiconductor Surface Analysis and Metrology for Cleaning Applications," Short Course, Sematech Surface Preparation and Cleaning Conference, Austin, TX, March 23, 2009.
10. M. Rodwell, P. Majhi, J. Stathis, A. Muscat, Y. Chabal, Tutorial on "Advanced CMOS - Substrates, Devices, Reliability, and Characterization," preceding Symposium C: CMOS Gate-Stack Scaling -- Materials, Interfaces, and Reliability Implications, Materials Research Society Spring Meeting, April 13, 2009, San Francisco, CA.
11. A. J. Muscat, F. L. Lie and B. Imangholi, "Interface Formation Mechanisms for high-k Layers Deposited on III-V Substrates," Materials Research Society Spring Meeting, April 16, 2009, San Francisco, CA.
12. B. Granados, F. L. Lie, and A. J. Muscat, "Surface Chemistry of Al(CH₃)₃ and TiCl₄ on GaAs and InGaAs during atomic layer deposition," Microscopy and Microanalysis Conference, August 1, 2012, Phoenix, AZ.

CONTRIBUTED

1. B. Xie, A. J. Muscat, "Silanol condensation in porous MSQ (p-MSQ) using supercritical CO₂," 5th International Conference on Microelectronics and Interfaces (ICMI), American Vacuum Society (AVS), Santa Clara, CA, March 1-3, 2004.
2. B. Xie, A. J. Muscat, "Repair of porous MSQ (p-MSQ) using supercritical CO₂," Materials

for Advanced Metallization (MAM) Conference, Brussels, Belgium, March 3-7, 2004.

3. B. Xie, A. J. Muscat, "Repair of porous carbon doped oxide low-k films using supercritical CO₂," Materials Synthesis and Processing in Supercritical Fluids, 227th American Chemical Society (ACS) National Meeting, Anaheim, CA, March 28-April 1, 2004.
4. B. Xie, A. J. Muscat, "Repair of porous carbon doped ultra low-k films using scCO₂," Materials, Technology, and Reliability for Advanced Interconnects and Low-k Dielectrics, Materials Research Society (MRS), Spring Meeting, San Francisco, CA, April 13-15, 2004.
5. B. Xie, A. J. Muscat, "Silylation of ashing damaged ultra low-k MSQ films using scCO₂," 5th Annual International Sematech Wafer Cleaning and Surface Preparation Conference, Austin, TX, May 6-7, 2004.
6. B. Xie, G. Montaño-Miranda, C. C. Finstad, A. J. Muscat, "Native oxide removal from SiGe thin films using nonaqueous chemistries," 2nd International SiGe Technology and Device Meeting, Frankfurt (Ober), Germany, May 16-19, 2004.
7. B. Xie, A. J. Muscat, "Capping of porous ultra low-k MSQ films using scCO₂," International Sematech Process Advisory Group Meeting, Austin, TX, June 26, 2004.
8. C. C. Finstad, A. J. Muscat, "UV-activated surface preparation of silicon for high-k dielectric deposition", 7th International Symposium of Ultra Clean Processing of Silicon Surfaces (UCPSS), Brussels, Belgium, September 20-22, 2004.
9. B. Xie, A. J. Muscat, "Repair and capping of porous ultra low-k films using scCO₂," 7th International Symposium of Ultra Clean Processing of Silicon Surfaces (UCPSS), Brussels, Belgium, Sept. 20-22, 2004.
10. B. Xie, A. J. Muscat, E. Busch, T. Rhoad, "Repair and capping of porous ultra low-k films using scCO₂," Advanced Metallization Conference, San Diego, CA, October 19-21, 2004.
11. C. C. Finstad, A. J. Muscat, "UV activated surface preparation of silicon for high-k dielectric deposition," American Vacuum Society (AVS) 51st International Symposium, Los Angeles, CA, Nov. 20, 2004.
12. B. Xie, A. J. Muscat, "Repair and capping of porous MSQ films using supercritical CO₂," Materials for Advanced Metallization (MAM) Conference, Dresden, Germany, March 6-9, 2005.
13. S. Perry, A. J. Muscat, "Preparation of high quality Si/SiO₂ interfaces after extended exposure to ambient contamination using gas phase methoxy-passivation," International Conference on Microelectronics and Interfaces (ICMI), American Vacuum Society (AVS), Santa Clara, CA, March 21-23, 2005.
14. B. Xie, A. J. Muscat, "The deposition of alkylmonochlorosilane sealing layers on porous MSQ films using supercritical CO₂," Materials Research Society (MRS) Conference, San Francisco, CA, March 28-April 1, 2005.
15. B. Xie, L. Choate, R. Morrish, A. J. Muscat, "Repair and capping of porous MSQ films using supercritical CO₂," Sematech Surface Preparation and Cleaning Conference, Austin, TX, April 19-20, 2005.

16. S. Perry, A. J. Muscat, "Gas phase methoxy passivation of silicon surfaces," Sematech Surface Preparation and Cleaning Conference, Austin, TX, April 19-20, 2005.
17. B. Xie, L. Choate, A. J. Muscat, "Repair and capping of porous MSQ films using halosilanes and supercritical CO₂," Insulating Films on Semiconductors Conference, Leuven, Belgium, June 22-24, 2005.
18. H. Zhu, A. J. Muscat, "Control of reaction selectivity in plasmas by manipulating EEDF," Physical Electronics Conference, Madison, WI, June 2005.
19. A. G. Thorsness, A. J. Muscat, "Interfacial layer formation on Si(100) by halogen activation," Electrochemical Society (ECS) Conference, Los Angeles, CA, October 19, 2005.
20. M. Durando, A. J. Muscat, "Methods and kinetics of copper etching using HF in supercritical CO₂," American Institute of Chemical Engineers (AIChE) National Meeting, Cincinnati, OH, November 3, 2005.
21. R. Morrish, A. J. Muscat, "Etching of silicon oxynitride films in supercritical carbon dioxide," 19th Rocky Mountain Regional Meeting of the American Chemical Society, Tucson, AZ, October 14-18, 2006.
22. T. K. Moreno, W. Zimmt, N. Odegaard, R. A. Turner, B. Xie, A. J. Muscat, M. R. Riley, "Supercritical carbon dioxide (scCO₂) extraction of pesticides from simulated museum artifacts," 19th Rocky Mountain Regional Meeting of the American Chemical Society, Tucson, AZ, October 14-18, 2006.
23. L. N. Hatch, A. J. Muscat, B. Xie, "Repair and capping of porous MSQ films using chlorosilanes and supercritical carbon dioxide," 19th Rocky Mountain Regional Meeting of the American Chemical Society, Tucson, AZ, October 14-18, 2006.
24. E. Vyhmeister, A. J. Muscat, L. A. Estévez, D. Suleiman, L. Choate "Study of low-k film repair and pore sealing using chlorosilanes dissolved in scCO₂," 19th Rocky Mountain Regional Meeting of the American Chemical Society, Tucson, AZ, October 14-18, 2006.
25. F. L. Lee, A. J. Muscat, "Gas phase etching of III-V compound semiconductors," Materials Research Society (MRS) Spring Meeting – Symposium H: Characterization of oxide/semiconductor interface for CMOS technology, San Francisco, CA, April 9-13, 2007.
26. S. Siddiqui, A. J. Muscat, "Surface preparation of germanium using reactive gas phases," Materials Research Society (MRS) Spring Meeting – Symposium H: Characterization of oxide/semiconductor interface for CMOS technology, San Francisco, CA, April 9-13, 2007.
27. R. Morrish, A. J. Muscat, "Synthesis of nanoporous Ag and Ni by dealloying in supercritical CO₂," Nanoporous Materials: Chemistry and Applications, 211th Electrochemical Society (ECS) Meeting, Chicago, IL, May 9, 2007.
28. G. Ogden, A. J. Muscat, "Introducing LabView alongside controls-first semester findings," American Institute of Chemical Engineers National Meeting, Salt Lake City, Utah, November 4-9, 2007.
29. E. Vyhmeister, D. Suleiman, L. A. Estévez, A. J. Muscat, "In-situ FTIR analysis of porous low-k film repair," American Institute of Chemical Engineers National Meeting, Salt Lake City, Utah, November 8, 2007.

30. E. Vyhmeister, D. Suleiman, A. J. Muscat, L. A. Estévez, Solubility and binary phase equilibria of chlorosilanes in supercritical carbon dioxide,” American Institute of Chemical Engineers National Meeting, Salt Lake City, Utah, November 8, 2007.
31. F. L. Lie, A. J. Muscat, “Gas phase surface preparation of III-V compound semiconductors,” Sematech Surface Preparation and Cleaning Conference, Austin, TX, March 31-April 2, 2008.
32. F. L. Lie, B. Imangholi, W. Rachmady, A. J. Muscat, “Chemical and electrical characterization of high-k/III-V interfaces prepared in situ, Sematech Surface Preparation and Cleaning Conference, Austin, TX, March 24, 2009.
33. F. L. Lie, W. Rachmady, and A. J. Muscat, “Surface Preparation of Ternary III-V Compound Semiconductors for Atomic Layer Deposition of High-k Films,” Materials Research Society Spring Meeting, April 16, 2009, San Francisco, CA.
34. B. Imangholi, H. G. Parks, and A. J. Muscat, “Characterization of Surface Recombination Velocity on Thin High-k Gate Oxides via a Conductance Technique,” Materials Research Society Spring Meeting, April 16, 2009, San Francisco, CA.
35. R. Morrish and A. J. Muscat, “Dealloying multiphase AgCu thin films in supercritical carbon dioxide,” American Chemical Society, Division of Inorganic Chemistry: Chemistry of Materials, March 21, 2010, San Francisco, CA.
36. B. Imangholi, F. L. Lie, W. Rachmady, and A. J. Muscat, “Effect of surface composition on electrical performance of Ga_{0.49}In_{0.51}As/Al₂O₃ devices,” Materials Research Society Spring Meeting, April 5-9, 2010, San Francisco, CA.
37. B. Imangholi and A. J. Muscat, “Passivation of c-Si surfaces monitored by deep-level surface recombination velocity,” Materials Research Society, Photovoltaic Materials and Manufacturing Issues, October 4-7, 2010, Denver, CO.
38. S. Miller and A. J. Muscat, “Improvements in self-assembled monolayer quality and time scale,” American Vacuum Society, 57th International Symposium, ALD: Dielectrics for Semiconductors, October 19, 2010, Albuquerque, NM.
39. B. Granados and A. J. Muscat, “Surface reactions of TiCl₄ and Al(CH₃)₃ on GaAs(100),” American Vacuum Society, 57th International Symposium, ALD/CVD: Surface Chemistry and Fundamentals, October 19, 2010, Albuquerque, NM.
40. R. Jain and A. J. Muscat, “Effect of metal ions on lipid bilayer formation on semiconductor surfaces,” American Vacuum Society, 57th International Symposium, Biomolecules at Interfaces, October 20, 2010, Albuquerque, NM.
41. F. L. Lee, B. Imangholi, and A. J. Muscat, “Passivation of Al₂O₃/InGaAs interfaces by atomic layer deposition and annealing,” American Vacuum Society, 57th International Symposium, High-k Dielectrics for III-V Electronics, October 20, 2010, Albuquerque, NM.
42. F. Jiang and Anthony Muscat, “The effect of coordination ligand on the growth of ZnSe quantum dots,” Materials Research Society Spring Meeting, April 25-29, 2011, San Francisco, CA.
43. Ishan D. Joshipura, Feng Jiang, and Anthony J. Muscat, “Chemical Bath Deposition (CBD) of Cadmium Sulfide (CdS) As a Buffer Layer for a Prototype Low-Cost Solar Cell,”

American Institute of Chemical Engineers Student National Conference, Minneapolis, MN, October 17, 2011.

44. S. Miller and A. J. Muscat, "Quantum dot transfer using patterned self-assembled monolayers," American Vacuum Society, 58th International Symposium, Group III-Nitrides and Hybrid Devices, October 31, 2011, Nashville, TN.
45. B. Granados and A. J. Muscat, "Nucleation and interface formation of Al₂O₃ on HF-treated InGaAs(100) by atomic layer deposition," American Vacuum Society, 58th International Symposium, ALD: Fundamental Reactions and Film Properties, November 1, 2011, Nashville, TN.
46. R. Jain, A. Ng, and A. J. Muscat, "Electroless deposition of metals on SiO₂ surfaces modified by a self-assembled monolayer," American Vacuum Society, 58th International Symposium, Hybrid Electronic Materials and Interfaces Session, November 3, 2011, Nashville, TN.
47. P. Mancheno-Posso and A. J. Muscat, "Small-molecule scaffolds for directed self-assembly," American Vacuum Society, 58th International Symposium, Electronic Materials and Processing Poster Session, November 3, 2011, Nashville, TN.
48. I. Joshipura, F. Jiang, and A. J. Muscat, "Chemical bath deposition (CBD) of cadmium sulfide (CdS) as a buffer layer for a prototype low-cost solar cell," Arizona Imaging and Microanalysis Society Annual Conference, March 2, 2012, Tempe, AZ.
49. Y. Fang, F. Jiang, and A. J. Muscat, "Deposition of CuInS₂ absorber layer for a prototype solar cell," Arizona Imaging and Microanalysis Society Annual Conference, March 2, 2012, Tempe, AZ.
50. N. Huq and A. J. Muscat, "Chemical bath deposition of ZnO thin films for applications in low-cost solar cell," Arizona Imaging and Microanalysis Society Annual Conference, March 2, 2012, Tempe, AZ.
51. J. Zhang and A. J. Muscat, "Sol-gel deposition of ZnO thin films for applications in low-cost solar cell," Arizona Imaging and Microanalysis Society Annual Conference, March 2, 2012, Tempe, AZ.
52. F. Jiang and A. J. Muscat, "Solvent-based control of quantum dot self-assembly into nanowires," 7th International Conference on Quantum Dots (QD 2012), May 12-18, 2012, Santa Fe, NM.
53. F. Jiang and A. J. Muscat, "Relative surface binding strengths for thiol ligands on aqueous colloidal ZnSe quantum dots," 7th International Conference on Quantum Dots (QD 2012), May 12-18, 2012, Santa Fe, NM.
54. R. Jain, A. Ng, E. White, "Electroless deposition of Co on SiO₂ surfaces modified by an aminosilane self-assembled monolayer," American Vacuum Society New Mexico Chapter Symposium, May 22, 2012, Albuquerque, NM.
55. P. Mancheno-Posso and A. J. Muscat, "Small-molecule scaffolds for directed self-assembly," American Vacuum Society New Mexico Chapter Symposium, May 22, 2012, Albuquerque, NM.

56. B. Granados and A. J. Muscat, "Growth inhibition of Al₂O₃ on InGaAs by atomic layer deposition, American Vacuum Society, 59th International Symposium, Reactions and Film Properties, October 30, 2012, Tampa, FL.
57. R. Jain, A. Ng, E. White, and A. J. Muscat, "Electroless deposition of Co on SiO₂ surfaces modified by an aminosilane self-assembled monolayer," American Vacuum Society, 59th International Symposium, Hybrid Electronic Materials and Interfaces Session, October 31, 2012, Tampa, FL.
58. P. Mancheno-Posso and A. J. Muscat, "Small-molecule scaffolds for directed self-assembly," American Vacuum Society, 59th International Symposium, Electronic Materials and Processing Poster Session, November 1, 2012, Tampa, FL.
59. Luke Yarnall, Pablo Mancheno, Anthony J Muscat, "Organic Thiol Passivation of Gallium Arsenide," Arizona/NASA Space Grant Symposium, April 12-13, 2013, Phoenix, AZ.
60. Feng Jiang and Anthony Muscat, "Development of Cu₂ZnSnS₄ Inks for Solution Processable Thin Film Solar Cells," Arizona Student Energy Conference, April 11-12, 2013, Tucson, AZ.
61. P. Mancheno-Posso and A. J. Muscat, "Chemical Passivation of GaAs (100) Using Alkanethiols," American Vacuum Society New Mexico Chapter Symposium, May 21, 2013, Albuquerque, NM.
62. A. Hinckley and A. J. Muscat, "Surface Deactivation of SiO₂ using Octadecyltrichlorosilane Based Self-Assembled Monolayers," American Vacuum Society New Mexico Chapter Symposium, May 21, 2013, Albuquerque, NM.
63. P. Mancheno-Posso and A. J. Muscat, "Chemical Passivation of GaAs (100) Using Alkanethiols," Session H: Dielectric and Semiconductor Materials, Devices, and Processing, 224th Electrochemical Society Meeting (ECS), October 27-November 1, 2013, San Francisco, CA.
64. P. Mancheno-Posso and A. J. Muscat, "Chemical Passivation of GaAs (100) Using Alkanethiols," American Vacuum Society 60th International Symposium, Hybrid Electronic Materials and Interfaces Session, October 30, 2013, Long Beach, CA.
65. A. Hinckley and A. J. Muscat, "Surface Deactivation of SiO₂ using Octadecyltrichlorosilane Based Self-Assembled Monolayers," American Vacuum Society 60th International Symposium, Hybrid Electronic Materials and Interfaces Session, October 30, 2013, Long Beach, CA.
66. L. Hubbard and A. J. Muscat, "Electrostatic Coating with Ligandless Copper Nanoparticles," Materials Research Society, December 3, 2013, Boston, MA.
67. AAA
68. P. Mancheno-Posso, A. J. Muscat, "Surface Chemistry of III-V Semiconductors Etching with Tartaric Acid," Surface Analysis 2014, June 2-5, 2014, Albuquerque, NM.
69. L. Hubbard, A. J. Muscat, "Electrostatic Coating with Ligandless Copper Nanoparticles," Surface Analysis 2014, June 2-5, 2014, Albuquerque, NM.