Frances Anne Houle

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Research Interests

Chemical modification of nanoparticle, semiconductor, metal and polymer interfaces, surfaces and films. Development of novel experimental methods for characterization of nanoparticle, thin film, surface and interface physics and chemistry including nanoscale composition, reaction mechanisms, nanomechanical properties. Nanoscale pattern formation. Stochastic simulation methods for complex chemical reactions including transport.

Education

Ph.D. Chemistry	California Institute of Technology, 1979
B.A. Chemistry	University of California at Irvine, *cum laude*, 1974
	Whittier College, Whittier, California (1970 - 1972)

Employment

3/2013-present	Department Head, Joint Center for Artificial Photosynthesis – North
	Staff Scientist, Chemical Sciences Division
8/2011-3/2013	Director of Strategic Initiatives, Chemical Sciences Division
	Lawrence Berkeley National Laboratory, Berkeley, CA
5/2011-present	Principal, Columbia Hill Technical Consulting, Fremont, CA
4/2009 – 4/2011	Manager, Materials Development
	InVisage Technologies, Inc, Menlo Park, CA
12/80 – 3/2009	Research Staff Member, Research Division
	Science and Technology Department
	International Business Machines Corporation, San Jose, CA
5/79 - 11/80	Postdoctoral Research Associate
	University of California at Berkeley Department of Chemistry and
	Lawrence Berkeley Laboratory

Awards, Honors and Fellowships

John A. Thornton Memorial Award and Lecture, American Vacuum Society, 2009.
IBM Research Division Accomplishment recognition for Mask Defect Root Cause, 2008
IBM Research Division Technical Group Award for Photoresist Limits, 2004
Gomes School Parent-Teachers Association Award (for developing the Science Fair), 2003
IBM Research Division Accomplishment recognition for Photoresist Limits, 2002
AIChE Northern California Section Chemical Engineering Excellence Award: Research Project of the Year (for Chemical Kinetics Simulator), 1999
IBM Corporate Environmental Affairs Excellence Award (for Chemical Kinetics Simulator), 1998
Fellow of the American Vacuum Society, 1996
IBM Supplemental Patent Issue Award for US patent 5446870, 1996
Fellow of the American Physical Society, 1992
IBM Outstanding Innovation Award for Laser Deposition of Metals, 1990
First Prize, IBM Computational Chemistry Challenge, 1990
IBM Invention Achievement Awards, First-Seventh Plateaus, 1985-2010

IBM Postdoctoral Fellowship, UCB/LBL, 1979-80
Herbert Newby McCoy Award for Outstanding Contributions in Chemistry, CIT, 1979
IBM Predoctoral Fellowship, CIT, 1977-78
Dean's Award for Outstanding Senior in Chemistry, UCI, 1974
ACS (Orange County Section) Award, UCI, 1974
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Selected Professional Activities

LBNL service –
Member, Opportunity Board, 2013-present
Divisional reviewer for Chemical Sciences and Materials Science, LDRD proposals, 2012-present
Member, Divisional Council, Chemical Sciences Division, 2011-present

Professional Society Memberships -
American Chemical Society, American Physical Society (Fellow), American Vacuum Society (Fellow), Materials Research Society

Editorial -
Co-Editor, "Laser Chemical Processing of Semiconductor Devices", F. A. Houle, T. F. Deutsch and R. M. Osgood, Jr., Materials Research Society, Pittsburgh, 1984.
Associate Editor, Journal of Vacuum Science and Technology A (1989-1993)
Co-Editor, "Surface Chemistry and Beam-Solid Interactions", H. Atwater, F. A. Houle and D. Lowndes, Materials Research Society, Pittsburgh, 1991.
Member of the Editorial Committee, Annual Reviews of Physical Chemistry (2001-2005)
Associate Editor, Journal of Vacuum Science and Technology B (2001-2003)

Professional Society Governance-
Board of Directors, Northern California Chapter, AVS (1982-1986)
AVS Thin Film Division Executive Committee (1988-1989)
AVS Board of Scholarship Trustees (1990-1992)
Vice Chair (1993), Program Chair (1994) and Chair (1995), Electronic Materials and Processing Division, AVS
Selection and Scheduling Committee, Gordon Research Conferences (1996-2002)
Council of the Gordon Research Conferences (1994, 1996-2002)
Nominations Committee, Division of Physical Chemistry, American Chemical Society (1998)
Nanometer-scale Science and Technology Division Executive Committee, AVS (2001-2002)
Nominating Committee, Division of Laser Science, American Physical Society (2001)
General Councilor, American Physical Society (2002-2005)
Chair, American Physical Society Task Force on Professional Ethics, Standards and Practices (2002-2003)
Member of the Executive Board, American Physical Society (2004-2005)
Member, Budget Committee, American Physical Society (2004-2006)
Member, Committee on Committees, American Physical Society (2005)
Member-at-large, Executive committee of the California Section, American Physical Society (2008-2010)
Member, American Physical Society Panel on Public Affairs (2009-2011).
Member, Fellowship Committee, American Physical Society (2010-2012).
Member, New Meetings Subcommittee, Materials Research Society (2012- present).

Conference Organization -
American Chemical Society National Meeting Program Committee (1983)

Materials Research Society Fall Meeting, Symposium Co-chair (1984, 1990)
Society of Photo -Instrumentation Engineers LA'84 Program Committee (1984)
Conference on Lasers and Electro - Optics Program Subcommittee Chair (1987), member (1988)
American Vacuum Society National Symposium Program Committee (1987, 1990, 1994 – EMPD Program Chair)
Microphysics of Surfaces, Beams and Adsorbates Topical Meeting Organizing Committee (1991,1995)
Chemistry of Electronic Materials Gordon Research Conference, Vice-chair (1992), Chair (1994 – theme of conference was chemical control in nanofabrication)
International Advisory Committee, 2nd International Conference on Laser Advanced Materials Processing, Japan (1992)
International Advisory Committee, First International Symposium on Laser and Optoelectronics Technology and Applications, Singapore (1993)
International Advisory Committee, 10th International Conference in Solid Films and Surfaces, Princeton, NJ (2000)
Advances in Resist Technology and Processing Program Committee, SPIE International Symposium on Microlithography, Santa Clara (2001-2003)
International Advisory Committee, 3rd African Materials Research Society Symposium, Casablanca, Tunisia (2005)
Resist Section, Electron, Ion and Photon Beams and Nanolithography Program Committee (2008)
Alternative Lithographic Technologies Program Committee, SPIE Advanced Lithography Symposium (2008-2009)
International Conference on Nanoimprint and Nanoprint Technology (2009)
Council for Chemical Research Chemical Innovation Forum and Annual Meeting, Washington DC (2013)

Committees -
Student Awards Judge, Materials Research Society Spring Meeting (1994)
Scientific Advisory Panel, Alice in Wonderland Project, an NSF-funded project at the
Children's Discovery Museum, San Jose, California (1998-1999)
Industrial Advisory Board, Graduate Training Program in Optical Sciences and Engineering, University of Colorado, Boulder (1998-1999)
Discussion Leader, Advanced and Emerging Materials Group, US-Africa Materials Workshop (Pretoria, South Africa, 2000)
Advisory Committee, African Materials Science Gateway project, Northwestern University and University of Witwatersrand (2001)
Organizing committee, 75th Anniversary of the Gordon Research Conferences (2002-2006)
ACS awards committee (2003 – 2005)
ACS awards committee (2006 – 2008)
Industrial Advisory Board, NSF Engineering Research Center for Extreme Ultraviolet Science and Technology, Colorado State University, University of Colorado, UC Berkeley and Lawrence Berkeley National Laboratory (2007- 2009).
American Institute of Physics Statistics Advisory Committee (2007-2009).
APS Ethics Education Web Site committee (2007- present)
National Academies committee to revise *On being a scientist* (booklet on scientific ethics) (2007-2008)
APS Panel on Public Affairs - MRS study on Energy – Critical Elements (2010-2011)
APS Physics Policy Committee - POPA study on innovation (2011-2012)

Review panels -
Review Panel for the Proposed Department of Energy Combustion Dynamics Facility (1989)

Review Panel, Materials Synthesis and Processing Initiative, National Science Foundation (1992)
NRC Board of Assessment for NIST, Subpanel for JILA (1996 - 1998)
NSF Panel for Materials Research Science and Engineering Centers (1996)
NSF Site Review Committee, Science and Technology Center (1996)
Committee of Visitors, Physics Division, National Science Foundation (1997)
NSF Site Review Committee, Proposed Science and Technology Center (1999)
Chair, NRC Board of Assessment for NIST, Subpanel for JILA (1999-2002)
NSF Site Review Committee, Materials Research Science and Engineering Center (2000)
NSF Review Panel for LIGO, Caltech/MIT (2001)
NSF Site Review Committee, Materials Research Science and Engineering Center (2005)

Research Funding

ONR grant for the 1994 Chemistry of Electronic Materials Gordon Research Conference, $6000.
NSF grant for the 1994 Chemistry of Electronic Materials Gordon Research Conference, DMR-9321393, $6000.
NATO grant CRG 951452, "Stochastic Simulation of Chemical Vapor Deposition of Amorphous Hydrogenated Silicon" with Prof. Dr. Peter Hess, Heidelberg University, Germany (1996-1998)
NIST ATP grant 70NANB7H7025 subaward from Anasys (2008-2009), support for a postdoc to provide nanoimprint materials for nanoscale IR characterization
DOE Facility User, Molecular Foundry, Lawrence Berkeley National Laboratory (2008-2009)
Principal Investigator, Joint Center for Artificial Photosynthesis (2013-present)

Refereed publications

1. The Nature of the Bonding of Li^+ to H_2O and NH_3; Ab Initio Studies
   R. L. Woodin, F. A. Houle and W. A. Goddard, III
   Chem. Phys. **14**, 461 (1976).
2. The First Ionization Potential of Ethyl Radical by Photoelectron Spectroscopy
   F. A. Houle and J. L. Beauchamp
   Chem. Phys. Lett. **48**, 457 (1977).
3. Detection and Investigation of Allyl and Benzyl Radicals by Photoelectron Spectroscopy
   F. A. Houle and J. L. Beauchamp
   J. Am. Chem. Soc. **100**, 3290 (1978).
4. On Exit Channel Coupling Effects in the Unimolecular Decomposition of Triatomics
   D. L. Bunker, K. R. Wright, W. L. Hase and F. A. Houle
   J. Phys. Chem. **83**, 933 (1979).
5. Photoelectron Spectroscopy of Methyl, Ethyl, Isopropyl and tert-Butyl Radicals. Implications for the Thermochemistry and Structures of the Radicals and their Corresponding Carbonium Ions
   F. A. Houle and J. L. Beauchamp
   J. Am. Chem. Soc. **101**, 4067 (1979).
6. Effects of Molecular Structure and Basicity. The Gas Phase Proton Affinities of Cyclic Phosphites
   R. V. Hodges, F. A. Houle, J. L. Beauchamp, R. A. Montag and J. G. Verkade
   J. Am. Chem. Soc. **102**, 932 (1980).
7. Simulation Methods in Kinetics Courses
   F. A. Houle and D. L. Bunker
   J. Chem. Educ. **58**, 405 (1981).
8. The Effect of Vibrational and Translational Energy on the Reaction Dynamics of the $H_2^+ + H_2$ System
   S. L. Anderson, F. A. Houle, D. Gerlich and Y. T. Lee
   J. Chem. Phys. **75**, 2153 (1981).
9. Vibrational Effects in Proton and Charge Transfer in the $H_2^+ + Ar$ System
   F. A. Houle, S. L. Anderson, D. Gerlich, T. Turner and Y. T. Lee
   Chem. Phys. Lett. **82**, 392 (1981).
10. Thermal Decomposition Pathways of Alkyl Radicals by Photoelectron Spectroscopy. Application to Cyclopentyl and Cyclohexyl Radicals
    F. A. Houle and J. L. Beauchamp
    J. Phys. Chem. **85**, 3456 (1981).
11. Nonadiabaticity in Ion-Molecule Reactions: Coupling of Proton and Charge Transfer in the H_2^+ and $D_2^+ + Ar$ System
    F. A. Houle, S. L. Anderson, D. Gerlich, T. Turner and Y. T. Lee
    J. Chem. Phys. **77**, 748 (1982).
12. Laser-Induced Chemical Etching of Metals and Semiconductors
    F. A. Houle and T. J. Chuang
    J. Vac. Sci. Technol. **20**, 790 (1982).
13. Gaseous Products from the Reaction of XeF_2 with Silicon
    H. F. Winters and F. A. Houle
    J. Appl. Phys. **54**, 1218 (1983).
14. Nonthermal Effects in Laser-Enhanced Etching of Silicon by XeF_2
    F. A. Houle
    Chem. Phys. Lett. **95**, 5 (1983).

15. Photoeffects on the Fluorination of Silicon. I. Influence of Doping on Steady-State Phenomena
F. A. Houle
J. Chem. Phys. **79**, 4237 (1983).
16. Photoeffects on the Fluorination of Silicon. II. Kinetics of the Initial Response to Light
F. A. Houle
J. Chem. Phys. **80**, 4851 (1984).
17. Photoelectron Spectroscopy of 1-Propyl, 1-Butyl, Isobutyl, Neopentyl and 2-Butyl Radicals: Free Radical Precursors to High Energy Carbonium Ions
J. C. Schultz, F. A. Houle and J. L. Beauchamp
J. Am. Chem. Soc **106**, 3917 (1984).
18. Photoelectron Spectroscopy of Isomeric $C_4.H_7$ Radicals. Implications for the Thermochemistry and Structures of the Radicals and their Corresponding Carbonium Ions
J. C. Schultz, F. A. Houle and J. L. Beauchamp
J. Am. Chem. Soc. **106**, 7336 (1984).
19. Mechanism of Laser-Enhanced Etching of Silicon
F. A. Houle
MRS Symp. Proc. **29**, 203 (1984).
20. Photochemical Generation and Deposition of Copper from the Gas Phase
C. R. Jones, F. A. Houle, C. A. Kovac and T. H. Baum
Appl. Phys. Lett. **46**, 97 (1985).
21. Laser Chemical Vapor Deposition of Copper
F. A. Houle, C. R. Jones, T. H. Baum, C. Pico and C. A. Kovac
Appl. Phys. Lett. **46**, 204 (1985).
22. Composition, Structure and Electric Field Variations in Photodeposition
R. J. Wilson and F. A. Houle
Phys. Rev. Lett. **55**, 2184 (1985).
23. Surface Processes Leading to Carbon Contamination of Photochemically Deposited Copper Films
F. A. Houle, R. J. Wilson and T. H. Baum
J. Vac. Sci. Technol. A **4**, 2452 (1986).
24. A Reinvestigation of the Etch Products of Silicon and XeF_2: Doping and Pressure Effects
F. A. Houle
J. Appl. Phys. **60**, 3018 (1986).
25. Basic Mechanisms in Laser Etching and Deposition
F. A. Houle
Appl. Phys. A **41**, 315 (1986) *(invited).*
26. Fundamental Aspects of Photon Assisted Processing
F. A. Houle
"Reduced Temperature Processing for VLSI", Electrochemical Society Symposium Proceedings **86-5**, 32 (1986).
27. Heat and Light in Laser-Materials Interactions
F. A. Houle
J. Vac. Sci. Technol. A **4**, 665 (1986).
28. Optical Self-Regulation during Laser-Induced Oxidation of Copper
L. Baufay, F. A. Houle and R. J. Wilson
J. Appl. Phys. **61**, 4640 (1987).
29. Dynamics of Desorption of SiF_4 During Etching of Silicon by XeF_2
F. A. Houle
J. Chem. Phys. **87**, 1866 (1987).

30. On the Relative Importance of Physical and Chemical Sputtering in Ion-Enhanced Etching of Silicon by XeF_2
    F. A. Houle
    Appl. Phys. Lett. **50**, 1838 (1987).
31. Real-Time Studies of Laser-Oxidation of Copper: Characteristics of an Optical Heat Source
    L. Baufay, F. A. Houle and R. J. Wilson
    MRS Symp. Proc. **75**, 281 (1987).
32. Interdependence of Optical Excitation and Surface Chemistry in Laser Induced Deposition and Etching
    F. A. Houle
    Laser Chemistry **9**, 107 (1988) *(invited)*.
33. Origin of Contaminants in Photochemically Deposited Chromium Films
    K. A. Singmaster, F. A. Houle and R. J. Wilson
    Appl. Phys. Lett. **53**, 1048 (1988).
34. Photostimulated Desorption in Laser-Assisted Etching of Silicon
    F. A. Houle
    Phys. Rev. Lett. **61**, 1871 (1988).
35. Desorption Dynamics of SiF_4 Etch Product
    F. A. Houle
    J. Vac. Sci. Technol. A**6**, 840 (1988).
36. Laser Deposition of Films from Acetylacetonate Complexes
    F. A. Houle, T. H. Baum and C. R. Moylan
    "Laser Chemical Processing for Microelectronics", K. Ibbs and R. M. Osgood, Jr., Editors, Cambridge University Press, Cambridge (1989), Chapter 2 *(invited)*.
37. Photochemical Etching of Silicon: the Influence of Photogenerated Charge Carriers
    F. A. Houle
    Phys. Rev. B**39**, 10 120 (1989).
38. Surface Reactions Leading to Contamination of Metal Films Photochemically Deposited from the Hexacarbonyls
    K. A. Singmaster, F. A. Houle and R. J. Wilson
    MRS Symp. Proc. **131**, 469 (1989).
39. Surface Photoprocesses in Laser Assisted Etching and Film Growth
    F. A. Houle
    J. Vac. Sci. Technol. B**7**, 1149 (1989).
40. Photochemical Deposition of Thin Films from the Metal Hexacarbonyls
    K. A. Singmaster, F. A. Houle and R. J. Wilson
    J. Phys. Chem. **94**, 6864 (1990).
41. Effect of Laser Heating on Compositions of Films Deposited from the Metal Hexacarbonyls
    K. A. Singmaster and F. A. Houle
    MRS Symp. Proc. **201**, 159 (1991).
42. Doping Effects on the Etching Chemistry of GaAs and Si
    F. A. Houle
    MRS Symp. Proc. **204**, 25 (1991).
43. Fundamental Aspects of Laser Deposition of Thin Metal Films: Chemistry of Contamination
    K. A. Singmaster and F. A. Houle
    "Symposia on Reliability of Semiconductor Devices/Interconnections and Dielectric Breakdown and Laser Processes for Microelectronic Applications", Electrochemical Society Proceedings 92-4, 265 (1992).

44. Continuous Wave Visible Laser-Assisted Decomposition of $Cr(CO)_6$ on a Growing Film: In Situ Observations
    F. A. Houle and L. I. Yeh
    J. Phys. Chem. **96**, 2691 (1992).
45. Chemical Changes Accompanying Facet Degradation of AlGaAs Quantum Well Lasers
    F. A. Houle, D. L. Neiman, W. C. Tang and H. J. Rosen
    J. Appl. Phys. **72**, 3884-3896 (1992).
46. Visible Laser Induced Nucleation and Growth of Cr, Mo and W Films from the Hexacarbonyls. Reactivity of CO on Film Surfaces
    F. A. Houle and K. A. Singmaster
    J. Phys. Chem. **96**, 10425-10439 (1992).
47. Electron Impact Fragmentation of Gases by Molecular Beam Mass Spectrometry. Application to $AsCl_3$ and a $GaCl_3/Ga_2Cl_6$ Mixture
    F. A. Houle
    Int. J. Mass. Spec. Ion Proc. **123**, 243-252 (1993).
48. Laser Assisted Chemical Vapor Deposition from the Metal Hexacarbonyls
    K. A. Singmaster and F. A. Houle
    Laser Chemistry of Organometallics, J. Chaiken, Ed. ACS Symposium Series **530**, Chapter 21 (1993).
49. Thermal and Acid-Catalyzed Deprotection Kinetics in Deep UV Resist Materials
    G. Wallraff, J. Hutchinson, W. Hinsberg, F. A. Houle, P. Seidel, R. Johnson, and W. Oldham
    J. Vac. Sci. Technol. B**12**, 3857-3862 (1994).
50. Kinetics of Thermal and Acid-Catalyzed Deprotection in Deep UV Resist Materials
    J. Hutchinson, G. Wallraff, W. Hinsberg, F. Houle and P. Seidel
    Microelectronic Engineering, **27**, 397-400 (1995).
51. Stochastic Simulations of Temperature Programmed Desorption Kinetics
    F. A. Houle and W. D. Hinsberg
    Surface Science, **338**, 329-346 (1995).
52. Simulations of Thermal Decomposition and Film Growth from the Group VI Metal Hexacarbonyls
    F. A. Houle and W. D. Hinsberg
    J. Phys. Chem. **99**, 14477-14485 (1995).
53. Stochastic Simulation of Heat Flow with Application to Laser-Solid Interactions
    F. A. Houle and W. D. Hinsberg
    Appl. Phys. A **66**, 143-151 (1998).
54. In Situ FTIR Spectroscopy and Stochastic Modelling of Surface Chemistry of Amorphous Silicon Growth
    U. Wetterauer, J. Knobloch, P. Hess and F. A. Houle
    J. Appl. Phys. **83**, 6096-6105 (1998).
55. Mechanistic Studies of Chemically Amplified Photoresists
    W. D. Hinsberg, G. Wallraff, F. A. Houle, M. Morrison, J. Frommer, R. Beyers and J.Hutchinson
    Organic Thin Films, ACS Symposium Series, C. Frank, ed., Amer. Chem. Soc., Washington DC, vol **695**, 344-359 (1998).
56. Deep UV Interferometric Lithography as a Tool for Assessment of Chemically Amplified Resist Performance
    W. D. Hinsberg, F. A. Houle, J. Hoffnagle, M. Sanchez, G. Wallraff, M. Morrison and S. Frank
    J. Vac. Sci. Technol. B **16**, 3689-3694 (1998).

57. Factors Controlling Pattern Formation in Chemically Amplified Resists at Sub-100 nm Dimensions.
W. Hinsberg, F. Houle, G. Wallraff, M. Sanchez, M. Morrison, J. Hoffnagle, H. Ito, C. Nguyen, C. Larson, P. Brock and G. Breyta
J. Photopolym. Sci. Tech., **12**, 649-662 (1999).
58. Liquid Immersion Deep-UV Interferometric Lithography
J. Hoffnagle, W. D. Hinsberg, M. Sanchez and F. A. Houle
J. Vac. Sci. Technol. B **17**, 3306 (1999).
59. Determination of Coupled Acid Catalysis-Diffusion Processes in a Positive Tone Chemically Amplified Photoresist
F. A. Houle, W. D. Hinsberg, M. Morrison, G. Wallraff, C. Larson, M. Sanchez and J. Hoffnagle
J. Vac. Sci. Technol. B **18**, 1874-1885 (2000).
60. Chemistry and Physics of the Post-expose Bake Process in Chemically Amplified Resists
W. Hinsberg, F. Houle, M. Sanchez and G. Wallraff
IBM Journal of Research and Development, **45**, 667 (2001) *(invited*).
62. The influence of resist components on image blur in a patterned positive-tone chemically amplified photoresist
F. A. Houle, W. D. Hinsberg, M. I. Sanchez and J. A. Hoffnagle
J. Vac. Sci. Technol. B **20**, 924-931 (2002).
63. Product volatilization as a probe of the physics and chemistry of latent image formation in chemically amplified resists
W. D. Hinsberg, F. A. Houle, G. M. Poliskie, D. Pearson, M. I. Sanchez, and H. Ito
J. Phys. Chem. A **106**, 9776-9787 (2002), *invited*
64. High NA lithography imagery at Brewster's angle
T. A. Brunner, J.A. Hoffnagle, W. D. Hinsberg, F. A. Houle, M. I. Sanchez
J. Microlith. Microfab. Microsys. **1**, 188 (2002).
65. A method to measure the spatial resolution of a photoresist
J. A. Hoffnagle, W. D. Hinsberg, M. I. Sanchez and F. A. Houle
Optics Lett. **27**, 1776-1778 (2002).
66. Kinetic model of positive-tone resist dissolution and roughening
F. A. Houle, W. D. Hinsberg and M. I. Sanchez
Macromolecules **35** 3591-3600 (2002).
67. Use of interferometric lithography to characterize the spatial resolution of a photoresist film
J. A. Hoffnagle, W. D. Hinsberg, F. A. Houle and M. I. Sanchez
J. Photopolymer Sci. Technol. **16**, 373 (2003).
68. Statistical limitations of printing 50 and 80 nm contact holes by EUV lithography
G. M. Gallatin, F. A. Houle, and J. L. Cobb
J. Vac. Sci. Technol.B **21**, 3172-3176 (2003).
69. Acid-base reactions in a positive tone chemically amplified photoresist and their effect on imaging
F. A. Houle, W. D. Hinsberg and M. I. Sanchez
J. Vac. Sci. Technol.B **22**, 747-757 (2004).
70. Ethics and the Welfare of the Physics Profession
K. Kirby and F. A. Houle
Physics Today, November, 2004, pages 42-46.
71. Sub-50nm half-pitch imaging with a low activation energy chemically amplified photoresist
G. M. Wallraff, D. R. Medeiros, M. Sanchez, K. Petrillo, W.-S. Huang, C. Rettner, B. Davis, C. E. Larson, L. Sundberg, P. J. Brock, W. D. Hinsberg, F. A. Houle, J. A. Hoffnagle, D. Goldfarb, K. Temple, S. Wind and J. Bucchingnano
J. Vac. Sci. Technol. B **22**, 3479-3484 (2004).

72. Characterization of polymer reactive dissolution and swelling using a quartz crystal microbalance and reflectance interferometry
    W. Hinsberg, F. Houle, S-W. Lee, H. Ito and K. Kanazawa
    Macromolecules **38**, 1882-1989 (2005).
73. Numeric analysis of the role of liquid phase UV photochemistry in 193nm immersion lithography
    W. D. Hinsberg and F. A. Houle
    J. Vac. Sci. Technol. B **23**, 2427-2435 (2005).
74. Real-world kinetics via simulations
    F. A. Houle and W. D. Hinsberg
    Annual Reports in Computational Chemistry **2**, 3 (2006) *Invited.*
75. Numerical analyses of the roles of gas phase and liquid phase UV photochemistry in conventional and immersion 193 nm lithography
    William Hinsberg and Frances A. Houle
    Journal of Photopolymer Science and Technology **19**, 623 (2006).
76. Adhesion between template materials and UV-cured nanoimprint resists
    F. A. Houle, Eric Guyer, D. C. Miller and Reinhold Dauskardt
    J. Vac. Sci. Technol. B **23**, 2427 (2007).
77. Anti-adhesion considerations for UV nanoimprint lithography
    F. A. Houle, C. T. Rettner, D. C. Miller and R. Sooriyakumaran
    Appl. Phys. Lett. **90**, 213103 (2007).
78. Characterization of volatile species formed during exposure of photoresists to ultraviolet light
    F. A. Houle, V. R. Deline, H. Truong and R. Sooriyakumaran
    Macromolecules **40**, 7505-7512 (2007).
79. Nanoimprint Materials Systems
    F. A. Houle, D. C. Miller, A. Fornof, H. Truong, S. Raoux, R. Sooriyakumaran, H. Ito and M. Hart
    J. Photopolymer Sci Technol **21,** 563-572 (2008)
80. Metal-containing release layers for use with UV-cure nanoimprint lithographic template materials
    F. A. Houle, S. Raoux, D. C. Miller, C. Jahnes and S. Rossnagel
    J Vac Sci Technol B**26**, 1301-1304 (2008).
81. Quantification of outgassing of C, Si and S-containing products during exposure of photoresists
    F. A. Houle, N. Maxim, J. Huijbregtse, V. R. Deline, H. Truong and W. van Schaik
    J Vac Sci Technol B**27**, 654 (2009).
82. Introduction of Role Playing to a Research Ethics Module for the Undergraduate
    D. C. Miller, F. A. Houle, J. Stemwedel, J. Pesek and C. Wade
    Mater. Res. Soc. Proc. 1233, 1233-PP09-06 (2009).
83. Energy Critical Elements: Securing Materials for Emerging Technologies.
    APS Panel on Public Affairs and the Materials Research Society
    American Physical Society, 2011.

Other Publications

1. Rapid Laser-Induced Chemical Etching of Semiconductors
   F. A. Houle
   Proc. SPIE **385**, 127 (1983).
2. Adducts of Cu(II) b-Diketonates with Oxygen Donor Ligands: Molecular Structure of Bis(hexafluoroacetylacetonate) Copper(II) (Ethanol)
   C. A. Kovac, C. R. Jones, T. H. Baum and F. A. Houle
   IBM Research Report RJ 4174 (1984).
3. Laser-Assisted Chemical Etching
   F. A. Houle
   Proc. SPIE **459**, 110 (1984).
4. Book Review, "Chemical Processing with Lasers", D. Bauerle, Springer-Verlag, Berlin (1986)
   F. A. Houle
   IEEE Circuits and Devices Magazine, **4**(6) 27 (1988).
5. Mechanistic Studies of Etching of Silicon by XeF_2
   F. A. Houle
   Symposium on Dry Process, Electrochemical Society Proceedings **88-7**, 17 (1988).
6. Mechanisms of Contamination in Photochemical Deposition of Thin Metal Films
   K. A. Singmaster, F. A. Houle and R. J. Wilson
   Proc. SPIE **1190**, 152 (1990)
7. Surface Chemistry of Laser-Assisted Film Growth
   F. A. Houle
   Proceedings of Laser Advanced Materials Processing, High Temperature Society of Japan, 203 (1992).
8. Modelling the Chemistry of Chemically Amplified Resists using a Stochastic Kinetics Simulator
   J. Hutchinson, G. Walraff, F. A. Houle, W. Hinsberg and P. Seidel
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