

Rhett T. Brewer

Intel Corporation
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EDUCATION

- Ph.D., Chemical Engineering** **July 2003**
California Institute of Technology
- M.S., Applied Physics** **June 2000**
California Institute of Technology
- B.S., Chemical Engineering** **May 1997**
Brigham Young University

RESEARCH EXPERIENCE AND POSITIONS

Senior Research Scientist **2004-**

Intel Corporation (Reporting to Kyu Min and Krishna Parat)

- Development of new memory structures for NAND flash application
- Collaborate with partner companies to develop new memory solutions
- Electrical characterization of capacitor, transistor, and arrays of novel gate stack devices for memory performance with a focus on charge retention. Analyze electrical data and make proposals for process and structural improvements.

Postdoctoral Research **2003-2004**

Rutgers University (Advisor: Prof. Yves Chabal)

- Atomic layer deposition (ALD) of high- κ dielectrics on Si
- *In situ* infrared spectroscopy of interface and surface species for ALD oxide growth on Si
- Functionalization of Si surface for Si/oxide interface engineering

Graduate Research Assistant **1997 - 2003**

California Institute of Technology (Thesis Advisor: Prof. Harry A. Atwater)

Current Research:

- Created C program to process electron diffraction patterns and extract information about the biaxial texturing of the material.
- Development of RHEED as a quantitative biaxial texture analysis tool
- Investigate biaxial texturing mechanisms of ion beam-assisted deposition of MgO
- Explore heteroepitaxy of ferroelectric materials onto biaxially textured MgO

Other Research:

- Investigation of plasma etching reaction mechanisms

Summer Intern Research

Summer 1997

Applied Materials, Santa Clara, CA

- Development of 300 mm etching chamber
- Investigated processes, using fluorine, to yield optimal s-poly Si/photoresist etching selectivity, etch rates, and trench profiles

Summer Intern Research

Summer 1996

Eastman Chemical Company, Longview, TX

- Built polymer producing batch reactor
- Improved process for the production of linear-low density polyethylene

TEACHING EXPERIENCE

Teaching Assistant

California Institute of Technology, Pasadena, CA

- Undergraduate Chemical Engineering Thermodynamics (2 quarters)
- Graduate Solid State Physics (1 quarter)
 - Provided help sessions to discuss problem sets
 - Graded homework assignments

Undergraduate Research Fellow Mentor

Summer 2000, 2002

California Institute of Technology, Pasadena, CA

- Planned summer research project
- Advised students on how to successfully complete the research project
- Aided students to give research presentations

REFEREED PUBLICATIONS

11. "Hydrogen barrier layer against silicon oxidation during atomic layer deposition of Al₂O₃ and HfO₂", M.M. Frank, Y. Wang, M.-T. Ho, **R.T. Brewer**, N. Moumen, Y.J. Chabal, J. Electro. Chem. Soc. **154**, G44 (2007).

10. "Ion backscattering study of ultr-thin oxides: Al₂O₃ and AlHfO_x films on Si" L.S. Wielunski, Y.J. Chabal, M. Paunescu, M.-T. Ho, **R. Brewer**, J.E. Reyes, Nucl. Instr. & Meth. In Phys. Res. B **241**, 377 (2005).

9. "Water reaction with chlorine-terminated silicon (111) and (100) surfaces", S. Rivillon, **R.T. Brewer**, Y.J. Chabal, Appl. Phys. Lett **87**, 173118 (2005).

8. "In situ infrared spectroscopy of hafnium oxide growth on hydrogen-terminated silicon surfaces by atomic layer deposition", M.-T. Ho, Y. Wang, **R.T. Brewer**, L.S. Wielunski, Y.J. Chabal, N. Moumen, M. Boleslawski, Appl. Phys. Lett. **87**, 133103 (2005).

7. "Growth of Biaxially-Textured Ba_xPb_{1-x}TiO₃ Ferroelectric Thin Films on Amorphous Si₃N₄", **R.T. Brewer**, D. A. Boyd, M. Y. El-Naggar, S. W. Boland, Y.-B. Park, S. M. Haile, D. G. Goodwin, and H. A. Atwater, J. Appl. Phys. **97**, 034103 (2005).

6. "Ammonia pretreatment for high-kappa dielectric growth on silicon", **R. T. Brewer**, M. – T. Ho, K. Z. Zhang, L. Goncharova, D.G. Starodub, T. Gustafsson, Y. J. Chabal, N. Moumen, Appl. Phys. Lett. **85**, 3830 (2004)
5. "Suppression of Subcutaneous Oxidation during the Deposition of Amorphous Lanthanum Aluminate on Silicon", L. F. Edge, D. G. Schlom, **R. T. Brewer**, Y. J. Chabal, J. R. Williams, S. A. Chambers, C. Hinkle, J. Lucovsky, Y. Yang, S. Stemmer, M. Coppel, Appl. Phys. Lett. **84**, 4629 (2004).
4. "Reflection High-Energy Electron Diffraction Experimental Analysis of Polycrystalline MgO Films with Grain Size and Orientation Distributions", **R.T. Brewer**, J.R. Groves, P.N. Arendt, and Harry A. Atwater, J. Appl. Phys. **93**, 205 (2003).
3. "Reflection High-Energy Electron Diffraction Analysis of Polycrystalline Films With Grain Size and Orientation Distributions" J.W. Hartman, **R.T. Brewer**, and Harry A. Atwater, J. Appl. Phys. **92**, 5133 (2002).
2. "Rapid Biaxial Texture Development During Nucleation of MgO Thin Films During Ion Beam-Assisted Deposition", **R.T. Brewer** and H.A. Atwater, Appl. Phys. Lett. **80**, 3388 (2002).
1. "RHEED In-Plane Rocking Curve Analysis of Biaxially-Textured Polycrystalline MgO Films on Amorphous Substrates Grown by Ion Beam-Assisted Deposition", **R.T. Brewer**, J.W. Hartman, J.R. Groves, P.N. Arendt, P.C. Yashar, H.A. Atwater, Appl. Surf. Sci. **175-176**, 691 (2001).

Proceedings Articles

"Growth of Biaxially-Textured $Ba_xPb_{1-x}TiO_3$ Ferroelectric Thin Films on Amorphous Si_3N_4 ", Rhett T. Brewer, D. A. Boyd, M. Y. El-Naggar, S. W. Boland, Y.-B. Park, S. M. Haile, D. G. Goodwin, and H. A. Atwater, Proc. Electrochem. Soc. Fall 2003, *submitted*.

"*In Situ* Biaxial-Texture Analysis of MgO Films on Amorphous Substrates During Ion Beam-Assisted Deposition", **R.T. Brewer**, J.R. Groves, P.N. Arendt, H.A. Atwater, Mat. Res. Soc. Symp. Proc. **672**, O6.2 (2001).

"Quantitative RHEED Analysis of Biaxially-Textured Polycrystalline MgO Films on Amorphous Substrates Grown by Ion Beam-Assisted Deposition", **R.T. Brewer**, J.W. Hartman, and H.A. Atwater, Mat. Res. Soc. Symp. Proc. **585**, 75 (2000).

HONORS

Intel Divisional Recognition Awards (Q1 2006, Q3 2007)
 Materials Research Society Graduate Student Award Silver Medalist (2002)
 Intel Foundation Fellowship (2001-2002)
 National Science Foundation Graduate Research Fellowship (1997-2000)
 Barry Goldwater Scholarship (1996-1997)

ORCA Scholarship (BYU undergraduate research fellowship, 1996-1997)
Eastman Fellowship (1996-1997)
Brigham Young University Trustees Fellowship (4 yr. Tuition)
J.J. Christiansen Outstanding Senior Award
(BYU Chemical Engineering Department, 1997)
Athletic Academic Honors (BYU varsity swim team + GPA above 3.5, 1991)

TECHNICAL SKILLS

C Programming, Linux proficient, UHV chamber construction, XPS, RHEED, AFM, TEM, Auger, Ion Beam-Assisted Deposition (IBAD), XRD, Synchrotron x-ray scattering, Oxide MBE, Atomic Layer Deposition (ALD), Infrared spectroscopy, NAND flash single transistor fabrication, capacitor, transistor, and array NAND flash electrical characterization.

REFERENCES

Prof. Harry A. Atwater
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