

**Silicon Valley Expert Witness Group, Inc.  
Consultant Curriculum Vitae**

**John C. Bravman, Ph.D.**

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**Expertise**

- Integrated Circuit Manufacturing
  - IC Failure Processes and Phenomena
  - Mechanical Behavior of Thin Films
  - High Spatial Resolution Materials Analysis
  - Microelectronic Packaging
  - IP Analysis and Litigation
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**Professional Summary**

John C. Bravman is the Bing Centennial Professor , Materials Science and Engineering and, by courtesy, Electrical Engineering, Freeman–Thornton Vice Provost for Undergraduate Education, and Dean of the Freshman-Sophomore Residential College at Stanford University. Professor Bravman joined the Stanford faculty in 1985 after completing his B.S. (1979), M.S. (1982), and Ph.D. (1984) degrees at Stanford. From 1996 to 1999 he was Chairman of his department.

He has worked at the Fairchild Semiconductor Laboratories in Palo Alto, California, and has served as a consultant with several technology, venture capital, and legal firms, including Lockheed, National Semiconductor, Advanced Micro Devices, IBM, Intel, the Mayfield Fund, Mohr Davidow Ventures, Perkins Coie LLP, McDermott, Will & Emory LLP, and Jones Day LLP. He has served the government on many review boards, including the Solid State Sciences Committee, and has served on or chaired the national advisory board of the materials programs at Sandia National Laboratories and the chemical and materials sciences program at Lawrence Livermore National Laboratories. In 1994, he was President of the Materials Research Society.

Professor Bravman teaches and advises undergraduates at all levels and directs doctoral students in the areas of silicon process technology, the mechanical properties of thin films, and transmission electron microscopy. He is co-author of over 170 research publications. He has won nine teaching and advising awards while at Stanford, served as a Resident Fellow, a University Fellow, and has chaired many university committees.

**Employment History**

From: 2010      **Bucknell University**  
To:      Present      Lewisburg, PA  
                                 President & Professor of Electrical Engineering

## **Silicon Valley Expert Witness Group, Inc. Consultant Curriculum Vitae**

From: 1985      **Stanford University**  
To:      Present      Palo Alto, CA  
Department of Material Science & Engineering

- 2010-Present: Bing Centennial Professor, Emeritus, Materials Science & Engineering.
- 2001 –2010: Professor, by courtesy, Dept. of Electrical Engineering, Stanford University.
- 2001 – Interim Vice Provost for Student Affairs, Stanford University
- 1999 – 2010: Dean of the Freshman/Sophomore College, Stanford University.
- 1998 – 1999: Director, Center for Materials Research, Stanford University.
- 1996 – 1999: Chairman, Dept. of Materials Science & Engineering, Stanford University.
- 1995 – 2010: Professor, Dept. of Materials Science & Engineering, Stanford University.
- 1993 – 2001: Senior Associate Dean, School of Engineering, Stanford University.
- 1992 – 1993: Associate Dean for Undergraduate Affairs, School of Engineering, Stanford Univ.
- 1991 – 1995: Assc. Chairman, Dept. of Materials Science & Engineering, Stanford University.
- 1991 – 1995: Associate Professor, Dept. of Materials Science & Engineering, Stanford University.
- 1985 – 1991: Assistant Professor, Dept. of Materials Science & Engineering, Stanford University

From: 1979      **Fairchild Semiconductor**  
To:      1984      Palo Alto, CA  
Research Engineer, Research Laboratory

### **Consulting History**

From: 2007      **Virgin Fuels**  
To:      Present      London, U.K.  
Duties:      Technical Due Diligence

From: 2006      **HSH Nordbank**  
To:      2008      New York, NY.  
Duties:      Technical Consulting

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From: 2005      **Sharefare**  
To: 2007      Los Altos, CA  
Duties:      Technical Advisory Board

From: 2004      **Medlogics**  
To: Present    Santa Rosa, CA  
Duties:      Technical consulting

From: 2003      **Applied Plasma Lab, Inc.**  
To: 2008      Santa Clara, CA  
Duties:      Board of Directors

From: 2001      **Reflectivity, Inc.**  
To: 2005      Sunnyvale, CA  
Duties:      Technical consulting

From: 1998      **Mohr, Davidow Venture Capital Fund**  
To: 2003      Menlo Park, CA  
Duties:      Technical consulting

From: 1998      **Chair, National Advisory Board, Materials Science &  
Technology Programs**  
To: 2002      Sandia National Laboratories, NM  
Duties:      Technical consulting

From: 1992      **Mayfield Venture Capital Fund**  
To: 2000      Menlo Park, CA  
Duties:      Technical consulting

From: 1987      **Intel Corporation**  
To: 1990      Santa Clara, CA  
Duties:      Technical consulting

From: 1986      **National Semiconductor**  
To: 1992      Santa Clara, CA  
Duties:      Technical consulting

From: 1985      **Fairchild Semiconductor**  
To: 1987      Palo Alto, CA  
Duties:      Technical consulting

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**Litigation Support Experience**

Date: 2010-      **Perkins Coie, LLP (Seattle, WA)**  
Case            On Semiconductor v. Hynix Semiconductor, Elpida Memory,  
                      Nanya Technology and Hittite Microwave  
Project:        Patent litigation, testifying witness  
Status:         Ongoing

Date: 2010        **Kirkland & Ellis (Washington, DC)**  
Case            Spansion v. Samsung  
Project:        Patent litigation, testifying witness, ITC matter  
Status:         Complete

Date: 2010        **Irell & Manella (Los Angeles, CA)**  
Case            Tessera, Inc. v. Amkor  
Project:        Patent litigation, testifying witness  
Status:

Date: 2010        **Farella Braun & Martell**  
Case            Volterra Semiconductor v. Infineon Technologies  
Project:        Patent litigation, testifying witness,  
Status:         Complete

Date: 2009-      **Kirkland & Ellis (DE)**  
Case            Spansion v. Samsung  
Project:        Patent litigation, testifying witness, ITC matter  
Status:         Ongoing

Date: 2009-      **Sidley Austin**  
Case            Samsung v. Pioneer Corp  
Project:        Patent litigation, testifying witness  
Status:         Ongoing

Date: 2009        **O'Melveny & Myers**  
Case            Semiconductor Energy Laboratory v. Samsung  
Project:        Patent litigation, testifying witness  
Status:         Complete

Date: 2009        **Irell & Manella (Los Angeles, CA)**  
Case            LG Displays v. Chi Mei Optoelectronics  
Project:        Patent litigation, testifying witness  
Status:         Ongoing

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Date: 2009-           **Morrison & Foerster**  
Case               Applied Materials v. Advanced Microfabrication Equipment  
Project:          Patent litigation, testifying witness  
Status:          Ongoing

Date: 2009           **Lerner, David, Littenberg, Krumholz & Mentlik**  
Case               Tessera v, ST Microelectronics  
Project:          Patent re-examination, consulting expert  
Status:          Ongoing

Date: 2008-           **Winston Strawn**  
Case               S.O.I.TEC (Silicon on Insulator Technologies) v. MEMC  
                      Electronic Materials  
Project:          Patent litigation, testifying witness  
Status:          Complete

Date: 2008-           **Kirkland & Ellis**  
Case               On Semiconductor v. Samsung  
Project:          Patent litigation, testifying witness  
Status:          Complete

Date: 2008-09       **Quinn Emanuel Urquhart & Hedges**  
Case               Samsung v. SanDisk  
Project:          Patent litigation, testifying witness  
Status:          Ongoing

Date: 2007           **Fish & Richardson, P.C.**  
Case               Toshiba v. Hynix  
Project:          Patent infringement before the ITC.  
Status:          Complete

Date: 2007- 08      **Wolf, Greenfield & Sacks – Boston, MA**  
Case               Fujitsu v Nanya  
Project:          Patent Litigation, testifying expert  
Status:          Complete

Date: 2007-           **Baker Botts – New York, NY**  
Case               Agere v Sony;  
Project:          Patent Litigation, testifying expert  
Status:          Ongoing

Date: 2007- 08      **Baker Botts – New York, NY**  
Case               Samsung v. Pioneer Corp  
Project:          Patent Litigation, testifying expert  
Status:          Complete

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- Date: 2007-08     **Fish & Richardson, P.C.**  
Case            Renesas v. Samsung  
Project:        Patent litigation, testifying witness before ITC  
Status         Complete
- Date: 2007-08     **Fish & Richardson, P.C.**  
Case            Applied Materials v. SCC  
Project:        Patent litigation, testifying witness  
Status         Complete
- Date: 2006- 07     **Foley & Lardner (Palo Alto, CA)**  
Case            Kentucky Oil Technology N.V. v Memry Corporation and  
Schlumberger Technology Corporation.  
Project:        Trade secrets, consultant  
Status:         Complete
- Date: 2006-         **Sheppard, Mullin, Richter & Hampton (Los Angeles, CA)**  
Case            Northrop Grumman  
Project:        Contract dispute, consultant  
Status:         Ongoing
- Date: 2006- 08     **Irell & Manella (Los Angeles, CA)**  
Case            Tessera, Inc. v. Advanced Micro Devices, Inc., Spansion Inc.,  
Spansion Technology Inc., Spansion LLC, Advanced  
Semiconductor Engineering, Inc., ASE Inc., ChipMOS  
Technologies Inc., ChipMOS USA Inc., Siliconware Precision  
Industries Co. Ltd., Siliconware USA Inc., STMicroelectronics  
N.V., STMicroelectronics, Inc., STATSChipPac Ltd.,  
STATSChipPac, Inc., STATSChipPac (BVI) Limited.  
Project:        Patent litigation, testifying witness  
Status:         Complete
- Date: 2006- 08     **Irell & Manella (Los Angeles, CA)**  
Case            Tessera, Inc. v. Amkor  
Project:        Patent litigation, consultant  
Status:         Complete
- Date: 2006-07     **Kirkland & Ellis**  
Case            Ohmi v. Intel, IBM, Samsung and Micron  
Project:        Patent litigation, testifying witness  
Status:         Complete

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Date: 2006-07     **Kirkland & Ellis**  
Case     Samsung v. Matsushita  
Project: Patent litigation, testifying witness  
Status: Complete

Date: 2006     **Kirkland & Ellis**  
Case     Agere v. Atmel  
Project: Patent litigation, testifying witness  
Status: Complete

Date: 2006-07     **Perkins Coie, LLP (Seattle, WA)**  
Case     Ohmi v. Intel, IBM, Samsung and Micron  
Project: Patent litigation, testifying witness  
Status: Complete

Date: 2006     **Keker & Van Nest (San Francisco, CA)**  
Case     Sputtered Films Inc. v. Advanced Modular Sputtering  
Project: Trade secret litigation, Consultant  
Status: Complete

Date: 2005-06     **Fish & Richardson, P.C.**  
Case     JDS Uniphase v. Metconnex  
Project: Patent litigation, consultant  
Status: Complete

Date: 2005-06     **Fish & Richardson, P.C.**  
Case     Toshiba v. Hynix  
Project: Patent infringement before the ITC.  
Status: Complete

Date: 2005-07     **Keker & Van Nest (San Francisco, CA)**  
Case     Ohmi v. Intel, Samsung and Micron  
Project: Patent litigation; testifying witness.  
Status: Complete

Date: 2005-06     **Townsend Townsend & Crew (San Francisco, CA)**  
Case     Toshiba v. Hynix  
Project: Patent litigation; testifying witness  
Status: Complete

Date: 2004-05     **Paul, Hastings, Janofsky & Walker (San Diego, CA)**  
Case     TSMC v. SMIC  
Project: Trade secrets, consultant  
Status: Complete

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Date: 2004-05     **Heller, Ehrman, White & McAuliffe LLP**  
Case     Fujitsu Limited v. Cirrus Logic, et al.  
Project:     Product liability, testifying witness  
Status:     Complete

Date: 2004-05     **Perkins Coie, LLP (Seattle, WA)**  
Case     Semitool v. DMS  
Project:     Patent litigation  
Status:     Complete

Date: 2003-04     **Jones Day, LLP (Dallas, TX)**  
Case     Motorola v. Analog Devices  
Project:     Patent litigation, testifying witness  
Status:     Complete

Date: 2003     **McDermott Will & Emery (Orange County, CA)**  
Case     Motorola v. Analog Devices  
Project:     Patent litigation  
Status:     Closed

Date: 2003     **Kirkland & Ellis, LLP (New York, NY)**  
Case     Honeywell Electronic Materials  
Project:     Patent litigation, consultant  
Status:     Complete

Date: 2001-04     **Perkins Coie, LLP (Seattle, WA)**  
Case     Semitool v. Applied Materials, Novellus, Ebara  
Project:     Patent litigation, testifying witness  
Status:     Complete

Date: 1999-00     **Robins, Kaplan, Miller & Ciresi, LLP (Atlanta, GA)**  
Case     Raychem Corporation  
Project:     Patent litigation  
Status:     Complete

**Education**

<u>Year</u>	<u>College/University</u>	<u>Degree</u>
1984	Stanford University, Stanford, CA	PhD, Materials Science and Engineering
1982	Stanford University, Stanford, CA	MS, Materials Science and Engineering
1979	Stanford University, Stanford, CA	BS, Materials Science and Engineering

# **Silicon Valley Expert Witness Group, Inc.**

## **Consultant Curriculum Vitae**

### **Patents**

“Drug Delivery Systems Using Mesoporous Oxide Films”, Dimitrios Pantelidis and John C. Bravman, Patent Cooperation Treaty Patent Application, Submitted December 2004; Patent Application published October 2007

### **Honors and Awards**

1987	School of Engineering Distinguished Advisor Award, Stanford University
1988	Excellence in Teaching Award, Society of Black Scientists & Engineers
1989	Walter J. Gores Award for Excellence in Teaching, Stanford University
1990	Tau Beta Pi Engineering Honor Society Award for Excellence in Undergraduate Engineering Teaching, Stanford University
1991	Bradley Stoughton Award, ASM International
1992 – 1995	Bing Teaching Fellow, Stanford University
1992	Excellence in Teaching Award, Society of Women Engineers
1994	President, Materials Research Society
1995 – 1997	University Fellow, Stanford University
1997	Bing Centennial Professor, Stanford University
2001	Stanford Associates Award for Service to the Alumni Association
2004	Woody White Award, Materials Research Society.

### **External Service and Scholarly Activities**

1986 – 1987	Symposium Organizer, 1987 Fall Meeting of the Materials Research Society; “Workshop on Specimen Preparation for Transmission Electron Microscopy of Materials”
1987 – 1988	Symposium Organizer, 1988 Fall Meeting of the Materials Research Society; “Thin Films: Stresses and Mechanical Properties”
1988 – 1989	Organizing Committee, International Conference on Materials and Mechanisms of Superconductivity – High Temperature Superconductivity
1988 – 1989	Symposium Organizer, 1989 Meeting of the Electron Microscopy Society of America: “Structure and Reactivity of Metal – Semiconductor Interfaces”
1989 – 1990	Conference Chairman, 1990 Spring Meeting of the Materials Research Society

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- 1989 – 1990      Symposium Organizer, 1990 Spring Meeting of the Materials Research Society: “Laser Ablation for Thin Film Synthesis”
- 1989 – 1990      Symposium Organizer, 1990 Spring Meeting of the Materials Research Society: “Frontiers of Materials Science”
- 1990 – 1991      Symposium Organizer, 1991 Fall Meeting of the Materials Research Society; “Thin Films: Stresses and Mechanical Properties III”
- 1990 – 1991      Symposium Organizer, 1991 Fall Meeting of the Materials Research Society; “Workshop on Specimen Preparation for Transmission Electron Microscopy of Materials III”
- 1991 – 1993      Council Member, Materials Research Society
- 1991 – 1992      Symposium Organizer, 1992 Spring Meeting of the Materials Research Society: “Structure and Defects in Electronic Oxides”
- 1991 – 1996      Technical Editorial Board, Materials Research Society Bulletin
- 1992              Second Vice President, Materials Research Society
- 1992 – 1998      Editorial Board, Annual Reviews of Materials Science
- 1992              Guest Editor, July 1992 Issue of the Materials Research Society Bulletin; “Mechanical Properties of Thin Film Materials”
- 1993              First Vice President, Materials Research Society
- 1993 – 1995      Selection Committee, Bradley Stoughton Award, ASM International
- 1993, 2001      Member, National Advisory Board, Materials Science & Technology Programs, Sandia National Laboratories
- 1994 – 2002      Chair, National Advisory Board, Materials Science & Technology Programs, Sandia National Laboratories
- 1994              President, Materials Research Society
- 1994 – 1995      Conference Organizer, 3rd International Workshop on Stress Induced Phenomena, Stanford, CA
- 1995 – 1998      Solid States Sciences Committee of the National Research Council
- 1996 – 1999      Awards Committee, ASM International
- 1996 – 1999      Chair, Program Development Subcommittee, Materials Research Society
- 1996 – 1999      Member, Electronics and Photonics Program National Advisory Board, Sandia National Laboratories
- 1997 – 1998      Symposium Organizer, 1998 Spring Meeting of the Materials Research Society, “Materials Reliability in Microelectronics VIII”
- 1997 – 1998      Conference Organizer, 15 Biennial Conference on National Materials Policy, Washington, D.C.
- 1998 – 1999      Program Committee, 5th International Workshop on Stress Induced Phenomena, Stuttgart, Germany

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1998 – 1999	Chair, Long Range Planning Committee, Materials Research Society
1998 – 2001	Member, Editorial Board, Applied Physics Reviews
1998 – 2006	Associate Editor, Annual Reviews of Materials Science
2000 – 2004	Chair, Program Committee, Materials Research Society
2001	Member, Middle States Association Accreditation Review Panel, Cornell University
2001	Member, Middle States Association Accreditation Review Panel, University of Pennsylvania
2002 – 2006	Member, Director’s Review Board, Chemistry and Materials Science, Lawrence Livermore National Laboratory.
2002 – present	Visiting Committee, Massachusetts Institute of Technology
2005 – 2010	Board of Directors, LEAD Program for Underserved Youth.
2006 – 2010	Member, Advisory Board, Journal of Engineering Education

**UNIVERSITY SERVICE**

1986 – 1992; 96 –10	Freshman Advisor
1991 – 1992	Dean’s Advisory Group, Libraries & Information Resources
1991	Faculty Advisor, Freshman Alcohol Responsibility & Management Program
1991 – 1995	Committee on Residential Computing
1991 – 1997	Steering Committee, Continuing Education Program
1992	Faculty Expenditure Certification Process Task Force
1992 – 1995	Faculty Resident Fellow, Yost House Undergraduate Residence
1992	Search Committee, Director of Environmental Health and Safety
1992 – 1996	Chair, University Committee on Health and Safety
1993 – 1999	Chair, C-AAA Subcommittee on University and Departmental Honors
1993	Search Committee, Director of Residential Education
1993 – 1997	Faculty Senate of the Academic Council
1993 – 1999	Steering Committee, Center for Teaching and Learning
1993 – 1994	President’s Commission on Undergraduate Education at Stanford; Chair of Subcommittee on Technology in Teaching and Learning
1993 – 1995	C-ASIS Subc. on Distributed Information & Computing Environment
1994 – 1995	President’s Commission on Technology in Teaching and Learning
1994 – 1997	Board of Directors, Faculty Club
1993 – 1999	C-AAA Subcommittee on Academic Standing
1995 – 2004	Faculty Member, Stanford Sophomore College
1995	Search Committee, Dean of Students

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1995 – 1996	Committee on Committees
1995 – 1997	Design Committee for Cultures, Ideas & Values Program
1996	Search Committee, Director of Career Planning and Placement Center
1996 – 1998	Stanford University Board of Trustees Committee on Development
1996 – 1999	Writing Advisory Board
1996 – 2010	University Undergraduate Advisory Council
1996 – 1997	Residences Task Force
1996 – 1999	Executive Committee, Center for Materials Research
1997	Search Committee, Dean of Admissions & Financial Aid
1997 – 1999	Residence Programs Implementation Group
1998 – 2001	Stanford University Board of Trustees Committee on Nominations
1998 – 1999	Director, Center for Materials Research
1999	Elected Chair, Faculty Senate of the Academic Council
1999 – 2010	Dean of the Freshman/Sophomore College
1999 – 2010	Freeman–Thornton Vice Provost for Undergraduate Education
2000	Co–Chair, Search Committee, Dean of Admissions & Financial Aid
2000 – 2001	Provost’s Task Force, University Needs Assessment
2000 – 2003	Strategic Planning Board, Cantor Center for the Visual Arts
2001	Member, Search Committee, Dean of Humanities and Sciences
2001	Chair, Search Committee, Vice Provost for Student Affairs
2001	Interim Vice Provost for Student Affairs
2004 – 2005	Co-Chair, Search Committee, Dean of Admissions & Financial Aid
2004 – 2007	Dean of Potter College
2005 – 2006	Search Committee, Director of Athletics
2006	Co-Chair, Stanford Task Force Evaluating Education in the Residences
2006 – 2007	Search Committee, University Registrar
2006 – 2010	Chair, University Reaccreditation Steering Committee

**SCHOOL OF ENGINEERING SERVICE**

1986 – 1990	EE – ICL Faculty Search Committees (Silicon Processing; Sensors)
1986 – 1992	Radiation Safety Committee
1987 – 1992	School of Engineering Committee on Computers
1991 – 1992	Member of Undergraduate Council
1991 – 2006	Faculty Advisor, Tau Beta Pi Engineering Honor Society
1992 – 1993	MSE – EE Faculty Search Committee (Magnetic Materials & Devices)

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1992 – 1994	MSE – Chem. E. Faculty Search Committee (Comput. Materials Science)
1992 – 1993	Associate Dean for Undergraduate Affairs
1992 – 2010	Faculty Advisor, Stanford Solar Car Project
1993 – 2001	Senior Associate Dean for Student Affairs

**DEPARTMENT SERVICE**

1986 – 1987	Student Faculty Liaison Committee, Dept. of Materials Science
1986 – 1987	Industrial Affiliates Program Committee, Dept. of Materials Science
1986 – 1990	Advanced Degree Committee, Dept. of Materials Science
1986 – 1990	Curriculum Committee, Dept. of Materials Science
1986 – 1991	Project Director, X-ray Diffraction Lab., Dept. of Materials Science
1986 – 1991	Chair, Computer Committee, Dept. of Materials Science
1987 – 1991	Chair, Space and Building Committee, Dept. of Materials Science
1990 – 1995	Chair, Financial Aids Committee, Dept. of Materials Science
1991 – 1995	Associate Chairman, Dept. of Materials Science and Engineering
1996 – 1999	Chairman, Department of Materials Science & Engineering

**REFEREE**

Journals: Journal of Applied Physics, Applied Physics Letters, Journal of Materials Science, Journal of the Electrochemical Society, Physical Review B, IEEE Electron Device Letters, Journal of Materials Research, Physical Review Letters, Journal of Engineering Education

Agencies: National Science Foundation, Electric Power Research Institute, Air Force Office of Scientific Research, Department of Energy, Army Research Labs, Science and Engineering Research Council (Singapore)

**INVITED PRESENTATIONS AT CONFERENCES, WORKSHOPS, etc.**

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1. March, 1985 “High Resolution Microstructural Studies of VLSI Interfaces,” Electronic Materials Symposium, Northern California Section, AIME, Santa Clara, CA.
2. October, 1985 “Microstructural Characterization of LPCVD Tungsten Interfaces,” Second Annual Workshop on Tungsten & Other Refractory Metals, Albuquerque, NM.

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3. January, 1986 "High Resolution Microstructural Studies of Semiconductor Materials," 1986 Annual Meeting of the Society of Photo-Optical Instrumentation Engineers, Los Angeles, CA.
4. February, 1987 "High Resolution Microstructural Studies of Semiconductor Materials," Golden Gate Materials Technology Conference, San Francisco, CA.
5. June, 1987 "Structural Characterization of Silicon – LPCVD Tungsten Interfaces," 13th Western Regional Meeting for Electron Microscopy and Microbeam Analysis, Concord, CA.
6. July, 1987 "TEM Studies of Semiconductor Materials," Annual Meeting of the International Metallographic Society, Monterey, CA.
7. September, 1987 "Synthesis and Properties of Superconducting Perovskites," Regional Meeting of the Materials Research Society, Univ. of Washington, Seattle, WA.
8. January, 1988 "TEM Studies of VLSI Materials," Northern California American Vacuum Society Thin Film Microanalysis Seminar, San Jose, CA.
9. January, 1988 "Synthesis and Properties of Superconducting Perovskites," 1988 Annual Meeting of The Metallurgical Society, Phoenix, AZ.
10. April, 1988 "Morphology and Microstructure of LPCVD Tungsten Films," 1988 Spring Meeting of the Materials Research Society, Reno, NV.
11. September, 1989 "High Resolution Electron Microscopy of Semiconductor Interfaces," 12th Brazilian Congress on Electron Microscopy, Rio de Janeiro, Brazil.
12. April, 1990 "Beam Deflection Techniques for Studying Thin Film Mechanical Behavior," 1990 Spring Meeting of the Materials Research Society, San Francisco, CA.
13. June, 1991 "Mechanical Testing of Thin Films," 6th International Conference on Solid State Sensors and Actuators," San Francisco, CA.
14. November, 1991 "Mechanical Properties of Thin Film Aluminum," American Vacuum Society Annual Meeting, Seattle, WA.
15. March, 1992 "Mechanical Testing of Thin Film Media," The Metallurgical Society Annual Meeting, San Diego, CA.
16. April, 1992 "Mechanical Testing of Thin Film Materials," 1992 Spring Meeting of the Materials Research Society, San Francisco, CA.

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- 17. March, 1993                    “X-ray Determination of Strains, Stresses and Relaxation in Interconnection Metallizations,” Second International Workshop on Stress Induced Phenomena in Metallizations, Austin, TX.
- 18. June, 1994                    “Microstructure and Stresses in Sputtered Copper Films,” Symposium on Micromechanisms in Stressed Conductor Lines and Thin Films, Ringberg, Germany.
- 19. December, 1994                “In-situ Electromigration Testing of Aluminum Metallizations,” 1994 Fall Meeting of the Materials Research Society, Boston, MA.
- 20. April, 1995                    “Development of High Voltage SEM for In-situ Electromigration Testing,” 1995 Spring Meeting of the Materials Research Society, San Francisco, CA.
- 21. May, 1995                    “Development of High Voltage SEM for In-situ Electromigration Testing,” 1995 Meeting, European Materials Research Society, Strasbourg, France.
- 22. September, 1998                “In-Situ High Voltage Scanning Electron Microscopy for Electromigration Studies,” 14th Quadrennial International Conference on Electron Microscopy, Cancun, Mexico.
- 23. June, 2001                    “Micromechanical Testing of Free Standing Thin Films for MEMS Applications,” 2001 Mechanics and Materials Conference, San Diego. (Keynote)
- 24. June, 2001                    “In-Situ Dynamic Studies of Electromigration in Copper Metallizations,” 2001 Mechanics and Materials Conference, San Diego. (Keynote)
- 25. December, 2001                “Micromechanical Testing of Free Standing Thin Films for MEMS Applications,” 2001 Fall Meeting of the Materials Research Society, Boston, MA.

**INVITED PRESENTATIONS AT UNIVERSITIES, CORPORATIONS, ETC.**

- 26. December, 1984                “Transmission Electron Microscopy of Semiconductor Materials,” Department of Materials Science, Oregon Graduate Center.
- 27. January, 1985                “Transmission Electron Microscopy of VLSI Interfaces,” Rockwell International, Semiconductor Products Division, Los Angeles, CA.
- 28. January, 1985                “Transmission Electron Microscopy: A Tool for VLSI Research,” Hewlett Packard Research Laboratories, Palo Alto, CA.

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29. March, 1985                    “Morphological Aspects of Silicon – Silicon Dioxide VLSI Interfaces,” Texas Instruments Central Research Laboratories, Dallas, TX.
30. October, 1987                “Transmission Electron Microscopy of Thin Films and Interfaces,” Department of Materials Science and Mineral Engineering, Univ. of California at Berkeley.
31. May, 1988                     “Progress and Prospects in High Temperature Superconductors,” Raychem Corporation, Redwood City, CA.
32. June, 1988                    “An Assessment of LPCVD Tungsten for VLSI Metallizations,” XEROX Corp., Palo Alto Research Center, Palo Alto, CA.
33. April, 1989                   “Transmission Electron Microscopy: A Tool for VLSI Research,” National Semiconductor Corporation, Santa Clara, CA.
34. September, 1989            “Mechanical Properties of Thin Film Materials,” 12th Brazilian Congress on Electron Microscopy, Rio de Janeiro, Brazil.
35. October, 1989                “Mechanical Properties of Thin Film Materials,” Motorola Corporation, Phoenix, AZ.
36. February, 1991               “Microstructural Studies of Y–Ba–Cu–O High Tc Thin Films,” 1991 Stanford Symposium on Applications of Contemporary Electron Microscopy, Stanford, CA.
37. May, 1991                    “Mechanical Testing Techniques for Thin Film Structures,” Microelectronics Center of North Carolina, Research Triangle Park, NC.
38. September, 1991            “Processing and Structure of Y–Ba–Cu–O High Tc Thin Films,” Physical Sciences Colloquium, IBM Almaden Research Center, San Jose, CA.
39. November, 1991            “Mechanical Properties of Thin Films,” Department Colloquium, Materials Science and Engineering, U. C. Berkeley.
40. March, 1992                   “Mechanical Testing of Thin Film Media,” Department Colloquium, Materials Science and Engineering, University of Southern California, Los Angeles, CA.
41. November, 1992            “Mechanical Testing Techniques for Thin Film Structures,” Opening Dedication Ceremony, Max Planck Institut, Stuttgart, Germany.

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42. November, 1992      “Micron–Scale Mechanical Testing of Films and Layered Media,” Opening Dedication Ceremony, Max Planck Institut für Metallforschung; Stuttgart, Germany.
43. September, 1993      “Modern Techniques for Surface and Interface Analysis,” National Defense Academy, Japan.
44. October, 1993      “X-ray Methods for Determining Strains and Stresses in Thin Films and Interconnection Lines,” AFOSR Workshop on Stress and Reliability in Thin Film and Optical Materials, The Aerospace Corporation, Los Angeles, CA.
45. October, 1995      “Development of High Voltage SEM for In-situ Electromigration Testing,” University of California at Los Angeles.
46. November, 1996      “Development of High Voltage SEM for In-situ Electromigration Testing,” University of Michigan at Ann Arbor.
47. August, 1997      “How to be an Effective Engineering Educator,” Linköping University, Sweden
48. August, 1997      “How to be an Effective Engineering Educator,” Upsala University, Sweden
49. August, 1997      High Voltage Scanning Electron Microscopy for In-situ Electromigration Testing,” Royal Institute of Technology, Sweden
50. November, 1997      High Voltage Scanning Electron Microscopy for In-situ Electromigration Testing,” Georgia Institute of Technology.
51. February, 1998      “The Future of Engineering Education at Major Research Universities: Course Correction or New Paradigm?,” Symposium on Engineering Education for the 21st Century, Nagoya, Japan.
52. March, 1998      “Quantitative Assessments of Electromigration Lifetime,” Lehigh Univ.
53. November, 1998      “A New Method for Studying Electromigration in IC Interconnects,” Lawrence Berkeley Laboratory, Advanced Light Source Colloquium Series.

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

**Publications**

**ARCHIVAL-REFERRED JOURNALS**

1. "TEM Studies of the Polycrystalline Silicon – Silicon Dioxide Interface," J.C. Bravman and R. Sinclair, *Thin Solid Films*, 104, 153–61 (1983).
2. "Observation of Rapid Field Aided Diffusion of Silver in Metal Oxide Semiconductor Structures," J.D. McBrayer, R.M. Swanson, T.W. Sigmon and J.C. Bravman, *Applied Physics Letters*, 43, 653–54 (1983).
3. "The Preparation of Cross-section Specimens for Transmission Electron Microscopy," J.C. Bravman and R. Sinclair, *Journal of Electron Microscopy Technique*, 1, 52–61 (1984).
4. "Structure and Morphology of Polycrystalline Silicon – Single Crystal Silicon Interfaces," J.C. Bravman, G.L. Patton and J.D. Plummer, *Journal of Applied Physics*, 57, 2279–82 (1985).
5. "Physics, Technology and Modeling of Polysilicon Emitter Contacts for VLSI Bipolar Transistors," G.L. Patton, J.C. Bravman and J.D. Plummer, *IEEE Transactions on Electron Devices*, ED-33, 1754–68 (1986).
6. "Damage Calculation and Measurement for GaAs Amorphized by Si-Implantation," W.G. Opyd, J.F. Gibbons, J.C. Bravman and M.A. Parker, *Applied Physics Letters*, 49, 974–976 (1986).
7. "Observations of Beta-tungsten deposited by Low Pressure Chemical Vapor Deposition," D. C. Paine, J.C. Bravman and C. Y. Yang, *Applied Physics Letters*, 50, 498–500 (1987).
8. "The Mechanical Deflection of Cantilever Microbeams: A New Technique for Testing the Mechanical Properties of Thin Films," T. P. Weihs, S. Hong, J.C. Bravman and W.D. Nix, *Journal of Materials Research*, 3, 931–942 (1988)
9. "Molecular Beam Epitaxy of Layered Dy–Ba–Cu–O Compounds," D. G. Schlom, J. N. Eckstein, E. S. Hellman, S.K. Streiffer, J. S. Harris, M. R. Beasley, J.C. Bravman, T. H. Geballe, C. Webb, K. von Dessenneck and F. Turner, *Applied Physics Letters*, 53, 1660–1662. (1988).
10. "Microstructural Characterization of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films on  $\text{SrTiO}_3$  Using Four Axis X-ray Diffraction," J. Sizemore, R. Barton, A. Marshall and J.C. Bravman, *IEEE Transactions on Magnetics*, 25 (2), 2245-2249 (1989).
11. "Determination of High Field Enhanced Emission Rates with the Constant Capacitance–Voltage Transient Technique," M.B. Chang, H. Tomokage, J.J. Shiau, R. H. Bube, and J.C. Bravman, *Journal of Applied Physics*, 65, 2734–2738 (1989).
12. "Phase Characterization of Dysprosium Barium Copper Oxide Thin Films Grown on Strontium Titanate by Molecular Beam Epitaxy," E. S. Hellman, D. G. Schlom, A. F. Marshall, S.K. Streiffer, J. S. Harris, M. R. Beasley, J.C. Bravman and T. H. Geballe, *Journal of Materials Research*, 4, 476–95 (1989).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

13. "Elimination of Current Dissipation in High Transition Temperature Superconductors," J.Z. Sun, B. Lairson, C.B. Eom, J.C. Bravman and T.H. Geballe, *Science*, 247, 307–309 (1990).
14. "Microwave Properties of Highly Oriented  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin films," A. Inam, X.D. Wu, L. Nazar, M.S. Hegde, C.T. Rogers, T. Venkatesan, R.W. Simon, K. Daly, H. Padamsee, J. Kirchgessner, D. Moffat, D. Rubin, Q.S. Shu, D. Kalolitis, A. Fathy, V. Pendrick, R. Brown, B. Brycki, E. Belohoubek, L. Drabeck, G. Gruner, R. Hammond, F. Gamble, B.M. Lairson and J.C. Bravman, *Applied Physics Letters*, 56, 1178–80 (1990).
15. "Reduction of Magnetization Decay Rate in High  $T_c$  Superconductors," B. Lairson, J.Z. Sun, J.C. Bravman and T.H. Geballe, *Physical Review B*, 42, 1008–1011 (1990).
16. "Measuring Stiffnesses and Residual Stresses of Silicon Nitride Thin Films," S. Hong, T.P. Weihs, J.C. Bravman and W.D. Nix, *Journal of Electronic Materials*, 19, 903–909 (1990).
17. "Molecular Beam Epitaxial Growth of Layered Bi–Sr–Ca–Cu–O Compounds," D. G. Schlom, A. F. Marshall, J.T. Sizemore, Z.J. Chen, J. N. Eckstein, I. Bozovic, K.E. von Dessionneck, J.S. Harris and J.C. Bravman, *Journal of Crystal Growth*, 102, 361–375 (1990).
18. "Mechanical Properties and Microstructural Characterization of Al–0.5% Cu Thin Films," R. Venkatraman, J.C. Bravman, P.W. Davies, P.A. Flinn, D.B. Fraser and W.D. Nix, *Journal of Electronic Materials*, 19, 1231–7 (1990).
19. "The Microstructure of Fe and Ag Thin Films Grown by Molecular Beam Epitaxy on GaAs (001)," C.J. Chien, R.F.C. Farrow and J.C. Bravman, *Journal of Applied Physics*, 68, 4343–5 (1990).
20. "Vortex Pinning by Twin Boundaries in  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films," B.M. Lairson, S.K. Streiffer and J.C. Bravman, *Physical Review B*, 42, 10067–74 (1990).
21. "Magnetic ordering in strain-controlled epitaxial rare-earth films," R. F. C. Farrow, S. S. P. Parkin, W. Bennett, A. Segmuller, J. Chien, and J. C. Bravman, *Journal of Applied Physics*, 67, 5733 (1990).
22. "Growth of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films on Vicinal MgO Surfaces," S.K. Streiffer, B.M. Lairson and J.C. Bravman, *Applied Physics Letters*, 57, 2501–3 (1990).
23. "Synthesis and Properties of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films Grown In–Situ by 90° Off–Axis Single Magnetron Sputtering," C.B. Eom, J.Z. Sun, S.K. Streiffer, A.F. Marshall, B.M. Lairson, K. Yamamoto, S.M. Anlage, J.C. Bravman, T. H. Geballe, S.S. Laderman and R. C. Taber, *Physica C*, 171, 354–82 (1990).
24. "Role of Atomic Oxygen produced by ECR Plasma in the Oxidation of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films studied by In–situ Resistivity Measurements," K. Yamamoto, B.M. Lairson, C.B. Eom, R. H. Hammond, J.C. Bravman and T.H. Geballe, *Applied Physics Letters*, 57, 1936–8 (1990).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

25. "Thermal Activation of Vortex Motion in  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Films at Low Temperatures," B.M. Lairson, J.Z. Sun, T.H. Geballe, M. R. Beasley and J.C. Bravman, *Physical Review B*, 43, 10405–12 (1991).
26. "Magnetic Relaxation, J–E Characteristics and Possible Dissipation Mechanisms for High Tc Superconducting Films of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$ ," J.Z. Sun, C.B. Eom, B.M. Lairson, J.C. Bravman and T. H. Geballe, *Physical Review B*, 43, 3002–8 (1991).
27. "Oxidation Kinetics of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films in the Presence of Atomic Oxygen and Molecular Oxygen by In-situ Resistivity Measurements," K. Yamamoto, B.M. Lairson, J.C. Bravman and T.H. Geballe, *Journal of Applied Physics*, 69, 7189–7201 (1991).
28. "Microstructure of Ultrathin Films of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  on MgO," S.K. Streiffer, B.M. Lairson, C.B. Eom, J.C. Bravman and T. H. Geballe, *Physical Review B*, 43, 13007–13018 (1991).
29. "Thickness Dependence of the Twin Density in  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Thin Films Sputtered onto MgO Substrates," S.K. Streiffer, E.M. Zielinski, B.M. Lairson, and J.C. Bravman, *Applied Physics Letters*, 58, 2171–3 (1991).
30. "The Effect of Laser Reflowing on the Variation of Stress with Thermal Cycling in Aluminum Thin Films," R. Venkatraman, S. Chen and J.C. Bravman, *Journal of Vacuum Science and Technology A*, 9, 2536–42 (1991).
31. "Separation of Film Thickness and Grain Boundary Strengthening Effects in Al Thin Films on Si," R. Venkatraman and J.C. Bravman, *Journal of Materials Research*, 7, 2040–2048 (1992).
32. "Limits on the use of tunneling to describe the Pd–Ge ohmic contact to GaAs," A. Herrera-Gómez, P. L. Meissner, J. C. Bravman and W. E. Spicer, *Journal of Vacuum Science and Technology A*, 10, 1029 (1992).
33. "Nucleation and Growth Mechanisms of a,b–Axis Oriented  $\text{YBa}_2\text{Cu}_3\text{O}_{7-d}$  Films on  $\text{LaAlO}_3$ ," S.K. Streiffer, B.M. Lairson, E.M. Zielinski, and J.C. Bravman, *Physical Review B*, 47, 11431–38 (1993).
34. "Finite–Element Modeling and X–ray Determination of Stress in Passivated Al Lines During Thermal Cycling," P.R. Besser, A. Sauter–Mack, D. Fraser, and J.C. Bravman, *Journal of the Electrochemical Society*, 140, 1769–73 (1993).
35. "An X-ray Method for Direct Determination of the Stress State and Strain Relaxation in Micro–scale Passivated Metallization Lines During Thermal Cycling," P.R. Besser, S. Brennan, and J.C. Bravman, *Journal of Materials Research*, 9, 13–24 (1994).
36. "Elastic Strain Gradients and X-ray Line Broadening Effects as a Function of Temperature in Aluminum Thin Films on Silicon," R. Venkatraman, P.R. Besser, S. Brennan and J.C. Bravman, *Journal of Materials Research*, 9, 328–35 (1994).
37. "Understanding and Electrochemical Control of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  Thin Film Epitaxy on Yttrium Stabilized Zirconia," J.L. MacManus–Driscoll, T.H. Geballe, and J.C. Bravman, *Journal of Applied Physics*, 75, 412–422 (1994).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

38. "Effect of Ion Energy on the Diffusion of Si Implanted into GaAs," C.C. Lee, M.D. Deal, K.S. Jones, H.G. Robinson, and J.C. Bravman, Journal of the Electrochemical Society, 141, 2245-2249 (1994).
39. "Eliminating Dopant Diffusion after Ion Implantation by Surface Etching," C.C. Lee, M. E. Deal and J.C. Bravman, Applied Physics Letters, 64, 3302-3304 (1994).
40. "Observation of Voids Induced by Mechanical Stress and Electromigration in Passivated Al Lines Deposited at Different Purity Levels," T. Marieb, J.C. Bravman, P. Flinn, D. S. Gardner, and M. Madden, Applied Physics Letters, 64, 2424-6 (1994).
41. "The Effects of Silver and Lead on the Phase Stability of the Bi-2212 and Bi-2223 Phases Above and Below the Solidus Temperature," J.L. MacManus-Driscoll, J.C. Bravman, R. J. Savoy, G. Gorman and R.B. Beyers, Journal of the American Ceramic Society, 77, 2305-13 (1994).
42. "Effects of Barrier Layer and Annealing on Abnormal Grain Growth in Copper Thin Films," E.M. Zielinski, R.P. Vinci, and J.C. Bravman, Journal of Applied Physics, 76, 4516-23 (1994).
43. "Studies of Structural Disorder in  $\text{ReBa}_2\text{Cu}_3\text{O}_{7-x}$  Thin Films as a Function of Rare Earth Ionic Radius and Film Deposition Conditions," J.L. MacManus-Driscoll, J.A. Alonso, P. Wang, T.H. Geballe and J.C. Bravman, Physica C, 232, 288-308 (1994).
44. "Phase Equilibria and Melt Processing of  $\text{Bi}_2\text{Sr}_2\text{Ca}_1\text{Cu}_2\text{O}_{8+x}$  Tapes at Reduced Oxygen Partial Pressures, J.L. MacManus-Driscoll, P. Wang, J.C. Bravman and R.B. Beyers, Applied Physics Letters, 65, 2872-4 (1994).
45. "The Influence of Strain Energy on Abnormal Grain Growth in Copper Thin Films," E.M. Zielinski, R.P. Vinci, and J.C. Bravman, Applied Physics Letters, 67, 1078 - 1080 (1995).
46. "Transport Characterization of Calcium-Doped YBCO Thin Films," J.T. Kucera and J.C. Bravman, Physical Review B, 51, 8582-90 (1995).
47. "Thermal Strain and Stress in Copper Thin Films," R.P. Vinci, E.M. Zielinski, J.C. Bravman, Thin Solid Films, 262, 142-153 (1995).(Invited Review)
48. "Effects of Barrier Layer and Processing Conditions on Thin Film Cu Microstructure." E.M. Zielinski, R.P. Vinci, J.C. Bravman, Journal of Electronic Materials, 24, 1485-1492 (1995).
49. "Observations of Electromigration Induced Void Nucleation and Growth in Polycrystalline and Near-bamboo Passivated Al Lines," T. Marieb, P. Flinn, J.C. Bravman, D. Gardner, M. Madden, Journal of Applied Physics, 78, 1026-32 (1995).
50. "Diffusion of Implanted Be in  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  as a Function of Al Concentration and Anneal Temperature," C.C. Lee, M. Deal and J.C. Bravman, Applied Physics Letters, 66, 355-7 (1995).
51. "Phase Equilibria in the Y-Ba-Cu-O System and Melt Processing of Ag Clad  $\text{Y}_1\text{Ba}_2\text{Cu}_3\text{O}_{7-x}$  Tapes at Reduced Oxygen Partial Pressures," J.L. MacManus-Driscoll, J.C. Bravman and R.B. Beyers, Physica C, 241, 401-13 (1995).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

52. "Pseudo-Quaternary Phase Relations Near  $\text{Bi}_2\text{Sr}_2\text{Ca}_1\text{Cu}_2\text{O}_{8+x}$  in Reduced Oxygen Pressures," J.L. MacManus–Driscoll, J.C. Bravman and R.B. Beyers, *Physica C*, 251, 71-88 (1995).
53. "Modeling Diffusion in Gallium Arsenide: Recent Work," Y.M. Haddara, C.C. Lee, J.C. Hu, M.D. Deal & J.C. Bravman, *MRS Bulletin*, 20, #4, 41-50 (1995).
54. "Measurement and Interpretation of Strain Relaxation in Passivated Al–0.5%Cu Lines," P.R. Besser, T.N. Marieb, P.A. Flinn, and J.C. Bravman, *Journal of Materials Research*, 11, 184–193 (1996).
55. "The Effect of Encapsulant Material on the Diffusion of Beryllium in Molecular Beam Epitaxially Grown Gallium Arsenide," Y.M. Haddara, M.D. Deal and J.C. Bravman, *Applied Physics Letters*, 68, 1939–41 (1996).
56. "An Analysis Technique for Extraction of Thin Film Stresses from X-ray Data," G. Cornella, S.H. Lee, W.D. Nix, and J.C. Bravman, *Applied Physics Letters*, 71, 2949-52 (1997).
57. "Transient Diffusion of Beryllium and Silicon in Gallium Arsenide," Y. Haddara and J.C. Bravman, *Annual Reviews of Materials Science*, 28, 185–214 (1998)
58. "Void nucleation on intentionally added defects in Al interconnects," J. C. Doan, S.-H. Lee, J. C. Bravman, P. A. Flinn and T. N. Marieb, *Applied Physics Letters*, 75, 633-35 (1999).
59. "The Evolution of the Resistance of Aluminum Interconnects during Electromigration," J. C. Doan, J. C. Bravman, P. A. Flinn, and T. N. Marieb, *Microelectronics Reliability*, 40, 981-990 (2000).
60. A High–Voltage Scanning Electron Microscopy System for In–Situ Electromigration Testing," J. C. Doan, S.-H. Lee, N. E. Meier, J. C. Bravman, P. A. Flinn, T. N. Marieb and M. C. Madden, *Review of Scientific Instruments*, 71, 2848-2854 (2000).
61. "Stress Relaxation of Free Standing Aluminum Beams for Microelectromechanical Systems Applications," H.–J. Lee, G. Cornella and J. C. Bravman, *Applied Physics Letters*, 76, 3415-17 (2000).
62. "Differential Thermal Budget in Laser Processing: Application to Formation of Titanium Silicide," J. C. Bravman, G. Verma, and S. Talwar, *IEEE Electron Device Letters*, 21, #10, 482-84, (2000).
63. "Effects of Dielectric Materials on Electro-migration Failure," J. C. Doan, S. Lee, S.-H. Lee, P. A. Flinn, J. C. Bravman and T. N. Marieb, *Journal of Applied Physics*, 89, 7797-7808 (2001).
64. "Use of angle resolved x-ray photoelectron spectroscopy for determination of depth and thickness of compound layer structures," S. Spruytte, C. Coldren, J. Harris, D. Pantelidis, H.-J. Lee, J. Bravman, and M. Kelly, *Journal of Vacuum Science and Technology A*, 19, 603-608 (2001).
65. "Creating Process Margin in Laser Thermal Processing: Application to Formation of Titanium Silicide," G. Verma, S. Talwar and J. C. Bravman, *Applied Physics Letters*, 78, 925-27 (2001).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

66. "Submicron X-Ray Diffraction," A. A. MacDowell, R. S. Celestre, N. Tamura, R. Spolenak, B. Valek, W. L. Brown, J. C. Bravman, H. A. Padmore, B. W. Batterman and J. R. Patel, Nuclear Instruments & Methods In Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment 467, 936-43 Part 2, (2001).
67. "Miniature Nernstian Oxygen Sensors for Deposition and Growth Environments," E. van Setten, T. M. Gur, D. Blank, J. C. Bravman and M. R. Beasley, Review of Scientific Instruments, 73, 156-161 (2002).
68. "Formation of Titanium Silicide on Narrow Gates Using Laser Processing," G. Verma, C. Gelatos, S. Talwar, and J. C. Bravman, IEEE Transactions on Electron Devices, 49, #1, 42-48 (2002).
69. "Effect of interface conditions on yield behavior of passivated copper thin films," R. P. Vinci, S. A. Forrest, and J. C. Bravman, J. Mater. Res., 17, 1863 (2002).
70. "Stress-induced and electromigration voiding in aluminum interconnects passivated with silicon nitride," S.-H. Lee, J. C. Bravman, J. C. Doan, S. Lee, P. A. Flinn, and T. N. Marieb, Journal of Applied Physics, 91, 3653-57 (2002).
71. "Subcritical debonding of polymer/silica interfaces under monotonic and cyclic loading," J. M. Snodgrass, D. Pantelidis, M. L. Jenkins, J. C. Bravman, and R. H. Dauskardt, Acta Materilia, 50 (9), 2395-2411 (2002).
72. "High spatial resolution grain orientation and strain mapping in thin films using polychromatic submicron x-ray diffraction," N. Tamura, A. A. MacDowell, R. S. Celestre, H. A. Padmore, B. Valek, J. C. Bravman, R. Spolenak, W. L. Brown, T. Marieb, H. Fujimoto, B. W. Batterman and J. R. Patel, Applied Physics Letters, 80, 3724-26 (2002).
73. "Electromigration-induced plastic deformation in passivated metal lines," B. C. Valek, J. C. Bravman, N. Tamura, A. A. MacDowell, R. S. Celestre, H. A. Padmore, R. Spolenak, W. L. Brown, B. W. Batterman, and J. R. Patel; Applied Physics Letters, 81, 4168-70 (2002).
74. "Tensile failure by grain thinning in micromachined aluminum thin films," H.-J. Lee, P. Zhang, and J. C. Bravman, Journal of Applied Physics, 93, 1443-49 (2003).
75. "Scanning X-ray Microdiffraction with Submicrometer White Beam for Strain/Stress and Orientation Mapping in Thin Film," N. Tamura, A. A. MacDowell, R. Spolenak, B. C. Valek, J. C. Bravman, W. L. Brown, R. S. Celestre, H. A. Padmore, B. W. Batterman, and J. R. Patel, Journal of Synchrotron Radiation, 10, 137-43 (2003).
76. "Local plasticity of Al thin films as revealed by X-ray microdiffraction," R. Spolenak, W. Brown, N. Tamura, A. A. MacDowell, R. S. Celestre, H. A. Padmore, B. C. Valek, J. C. Bravman, T. Marieb, H. Fujimoto, B. W. Batterman, and J. R. Patel, Physical Review Letters, 90(9), (2003).
77. "Quantitative analysis of dislocation arrangements induced by electromigration in a passivated Al (0.5 wt % Cu) interconnect," R. I. Barabash, G. E. Ice, N. Tamura, B. C. Valek, J. C. Bravman, R. Spolenak and J. R. Patel, Journal of Applied Physics, 93 (9), 5701-06 (2003).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

78. "Early Stage of Plastic Deformation in Thin Films Undergoing Electromigration," B. C. Valek, N. Tamura, R. Spolenak, W. A. Caldwell, A. A. MacDowell, R. S. Celestre, H. A. Padmore, J. C. Bravman, B. W. Batterman, W. D. Nix, and J. R. Patel, *Journal of Applied Physics*, 94, 3757-61 (2003).
79. "Study on the strength and elongation of freestanding Al beams for microelectromechanical systems applications," H. J. Lee Zhang, J. C. Bravman, *Applied Physics Letters*, 84 (6), 915-17 (2004).
80. Quantitative characterization of electromigration-induced plastic deformation in Aluminum (0.5 wt % Cu) interconnect," , R. I. Barabash, G. E. Ice, N. Tamura, B. C. Valek, J. C. Bravman, R. Spolenak and J. R. Patel, *Microelectronic Engineering*, 75 (1), 24-30 (2004).
81. "Important Factors for Silane Adhesion Promoter Efficacy: Surface Coverage, Functionality, and Chain Length," M. L. Jenkins, R. H. Dauskardt, and J. C. Bravman, *Journal of Adhesion Science and Technology*, 18, 1483-88 (2005).
82. "Stress Relaxation in Free-Standing Aluminum Beams," H. J. Lee, P. Zhang, and J. C. Bravman, *Thin Solid Films*, 476, 118-24 (2005).
83. "White beam analysis of coupling between precipitation and plastic deformation during electromigration in a passivated Al (0.5 wt % Cu) interconnect," R. I. Barabash, G. E. Ice, N. Tamura, B. C. Valek, J. C. Bravman, R. Spolenak and J. R. Patel, *Metallofizika I Noveishie Tekhnologii* 27, 75-94 (2005) {in Russian}.
84. "Effect of Silane Functional Group on Adhesion of Selected Epoxies for Microelectronic Packaging", M. Jenkins-Borrego, R.H. Dauskardt, and J.C. Bravman, *Journal of Microelectronics and Electronics Packaging*, 4, 8-16 (2007).

**CONFERENCE PROCEEDINGS**

85. "High Resolution Transmission Electron Microscopy of Semiconductor Materials," R. Sinclair, F.A. Ponce, J.C. Bravman, T. Yamashita & P. Pirouz, 2nd Oxford Conference on Microscopy of Semiconducting Materials, Oxford, England; *Inst. of Physics Conf. Series*, 147-52 (1981).
86. "High Resolution Imaging of Semiconductor Interfaces," R. Sinclair, F.A. Ponce, T. Yamashita & J.C. Bravman, *Proc. of the Electron Microscopy Society of America #39*, G. Bailey, ed., 124-27 (1981).
87. "Interface Morphologies in the Polycrystalline Silicon-Silicon Dioxide Materials System," J.C. Bravman, *Proc. of the Electron Microscopy Society of America #41*, G. Bailey, ed., 108-09 (1983).
88. "The Morphology of the Polysilicon-Silicon Dioxide Interface," J.C. Bravman & R. Sinclair, *Proc. of the Materials Research Society #25: Thin Films and Interfaces II*, J. Baglin, D. Campbell & W. Chu, eds., 311-16 (1984).
89. "Structural Aspects of Polysilicon Emitter Contacts," J.C. Bravman, G.L. Patton and J.D. Plummer, *Electrochemical Society Extended Abstracts*, 84-2, 718-19 (1984).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

90. "Characterization of Bipolar Transistors with Polysilicon Emitter Contacts," G.L. Patton, J.D. Plummer and J.C. Bravman, 1984 IEEE Conference on VLSI Technology, 53–54, San Diego (1984).
91. "Morphological Studies of Polysilicon Emitter Contacts," J.C. Bravman, G.L. Patton, R. Sinclair & J.D. Plummer, Proc. of the Materials Research Society #37: Layered Structures, Epitaxy and Interfaces, J. Gibson & L. Dawson, eds., 461–66 (1985).
92. "Impact of Processing Parameters on Base Current in Polysilicon Contacted Bipolar Transistors," G.L. Patton, J.C. Bravman and J.D. Plummer, Proc. of the IEEE International Electron Devices Meeting, 30–33 (1985).
93. "Microstructural Characterization of LPCVD Tungsten Interfaces," J.C. Bravman, D.C. Paine and K.C. Saraswat, Proc. of the Materials Research Society: Tungsten and Other Refractory Metals for VLSI Applications (I), R. Blewer, ed, 117–24 (1986). (Invited Paper)
94. "High Resolution Microstructural Studies of Semiconductor Materials," J.C. Bravman, Proc. Society of Photo–Optical Instrumentation Engineers #623: Advanced Processing and Characterization of Semiconductors III, D. Sadana & M. Current, eds., 18–25 (1986). (Invited Paper)
95. "Preparation of Cross–sectioned Semiconductor Devices for Transmission Electron Microscopy," R. Anderson, J.C. Bravman, R. Flutie, E. Hall, B. Marcus & S. Newcomb, Video–taped Tutorial, recorded at 44th. Ann. Meeting Electron Microscopy Society of America (1986). (Invited Paper)
96. "High Performance Packaging for VLSI Systems," F. Pease, J.C. Bravman, O.K. Kwon, S. Hong, S.C. Douglas, B.W. Langley and A.F. Paul, Advanced Research in VLSI – Proc. of the 1987 Stanford Conference, P. Losleben, ed., 279–92, MIT Press (1987). (Invited Paper)
97. "Junction Leakage of Selectively Deposited LPCVD Tungsten for Contact Fill Applications," C. Yang, J. Multani, D. Paine and J.C. Bravman, Proc. of the 1987 IEEE VLSI Multilevel Interconnection Conference, 200–207 (1987).
98. "Conditions for the Deposition of Beta–Tungsten by Low Pressure Chemical Vapor Deposition," D.C. Paine, J.C. Bravman, M. Wong and C. Y. Yang, Electrochemical Society Extended Abstracts (1987).
99. "SUPREM 3.5, Process Modeling of Gallium Arsenide," M.E. Deal, S. E. Hansen, R. Anholt, S. Chou, J.D. Plummer, R.W. Dutton, D. A. Stevenson, C.R. Helms and J.C. Bravman, Proc. of the IEEE International Electron Devices Meeting, 256–259 (1987).
100. "Metastable Beta–tungsten in LPCVD Contacts to Silicon," D.C. Paine, J.C. Bravman and C. Y. Yang, Proc. of the Materials Research Society: Tungsten and Other Refractory Metals for VLSI Applications (III), V.A. Wells, ed., 95–101 (1988).
101. "Structural and Electrical Characterization of LPCVD Tungsten Contacts to Silicon," D. C. Paine and J.C. Bravman, 5th Oxford Conference on Microscopy of Semiconducting Materials, Oxford, England; Inst. of Physics Conf. Series #87, A.G. Cullis and P.D. Augustus, eds., 547–552, Inst. of Physics Press (1988).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

102. "Microstructures of Polysilicon," R. Sinclair, A.H. Carim, J. Morgiel and J.C. Bravman, Proc. of the Materials Research Society #106: Polysilicon and its Interfaces, C. Y. Wong, C. V. Thompson and K. N. Tu, eds., 27–38 (1988). (Invited Paper)
103. "Materials and Structures for High Density I/O Interconnection Systems," S. Hong, J.C. Bravman, T. P. Weihs and O. K. Kwon, Proc. of the Materials Research Society #108: Electronic Packaging Materials Science III, R. Jaccodine, K. Jackson and R. Sundahl, eds, 309–317 (1988).
104. "Synthesis and Properties of High Tc Thin Film Superconductors," J.C. Bravman and R. W. Barton, Microstructural Science for Thin Film Metallization in Electronic Applications, J. Sanchez, D.A. Smith and N. Delanerolle, ed.s., 3–6, The Minerals, Metals & Materials Society (TMS), Warrendale, PA (1988). (Invited Paper)
105. "Vortex Motion and Time Dependent Magnetic Responses in High Tc Superconductors," J.Z. Sun, C.B. Eom, B. Lairson, J.C. Bravman, T.H. Geballe and A. Kapitulnik, Proc. of the International Conference on Materials and Mechanisms of Superconductivity – High Temperature Super-conductors II, R. Shelton, W.A. Harrison and N.E. Phillips, eds., 687–688 (1989).
106. "Cantilever Beam Micro-contacts in a Multichip Interconnection System," S. Hong, T.P. Weihs, O.K. Kwon and J.C. Bravman, Proc. of the 1989 IEEE/CHMT International Electronic Manufacturing Symposium, 239–245 (1989).
107. "Design and Fabrication of a Monolithic High-Density Probe Card for High Frequency On-Wafer Testing," S. Hong and J.C. Bravman, Proc. of the IEEE International Electron Devices Mtg., 289–292 (1989).
108. "The Determination of Mechanical Parameters and Residual Stresses for Thin Films using Micro-cantilever Beams," S. Hong, T. P Weihs, J.C. Bravman and W.D. Nix, Proc. of the Materials Research Society #130: Thin Films – Stresses and Mechanical Properties, 93–98 (1989).
109. "TEM Studies of Semiconductor Materials," J.C. Bravman, Characterization of Advanced Materials, W. Altermatt and E. Henneke, eds., Plenum Press, 89 – 96 (1990). (Invited Paper)
110. "Morphology and Defect Structure of Sputtered High-Quality in-situ YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-d</sub> Films," S.K. Streiffer, B.M. Lairson, C.B. Eom, J.C. Bravman, A.F. Marshall and T.H. Geballe, Proc. of the Materials Research Society, #183, 363–68 (1991).
111. "Mechanical Testing of Thin Films," R.P. Vinci and J.C. Bravman, Proc. of the 6th International Conference on Solid State Sensors and Actuators," IEEE Press, 943–48 (1991). (Invited Paper)
112. "Synthesis and Properties of Ultra-Thin YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> and YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>/La<sub>2-x</sub>Sr<sub>x</sub>Cu<sub>3</sub>O<sub>7</sub> Multilayers," C.B. Eom, S.K. Streiffer, J.Z. Sun, K. Yamamoto, S.S. Laderman, J.C. Bravman, and T.H. Geballe, Proc. of the Materials Research Society #169, 557–60 (1991).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

113. "Investigation of Thin Pd–Ge Layer Formation using Synchrotron Vacuum Ultraviolet Photoemission Spectroscopy," P.L. Meissner, J.C. Bravman, T. Kendelewicz, K. Miyano, J.C. Woicik, C. Bouldin and W. E. Spicer, Proc. of the Materials Research Society #181: Advanced Metallizations in Microelectronics, A. Katz, S. P. Murarka, A. Appelbaum, eds., 265–270 (1990).
114. "Microstructural Investigation of Ultra–thin Films of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Grown on MgO," S.K. Streiffer, C.B. Eom, T. H. Geballe and J.C. Bravman, Proceedings of the XIIth International Congress for Electron Microscopy, 4, 6–7 (1990).
115. "Investigation of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7– $\delta$</sub>  Films Grown on Vicinally–Polished MgO Substrates," S.K. Streiffer, B.M. Lairson, and J.C. Bravman, Proc. of the Materials Research Society #209, 777–82 (1991).
116. "On the Microstructure of Ultrathin Films of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7– $\delta$</sub> ," S.K. Streiffer, B.M. Lairson, C.B. Eom, T.H. Geballe, and J.C. Bravman, Program of the 1991 March Meeting of the American Physical Society, Bulletin of the American Physical Society #36, 425 (1991).
117. "Critical Currents and Magnetization Decay in Oxygen Deficient YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Thin Films," B.M. Lairson, J. Vargas, S.K. Streiffer, D.C. Larbalestier and J.C. Bravman, Proc. of the International Conference on Materials and Mechanisms of Superconductivity – High Temperature Superconductors III, in Physica C, 2161–62 (1991).
118. "Initial Conditions in Magnetization Decay of High T<sub>c</sub> Superconducting Films," B.M. Lairson, J.Z. Sun, T.H. Geballe and J.C. Bravman, Proc. of the International Conference on Materials and Mechanisms of Superconductivity – High Temperature Superconductors III, in Physica C, 2519–20 (1991).
119. "Barrier Height Reduction at the Pd–Ge/n–GaAs Interface," P.L. Meissner, J.C. Bravman, T. Kendelewicz, C.J. Spindt, A. Herrera–Gomez, W. A. Spicer and A.J. Arko, Proc. of the Materials Research Society, #240, 485–490 (1992).
120. "Calculation of Stress Gradients in Thin Al – 0.5% Cu/Ti Lines from Strain Gradients Measured as a Function of Temperature using Grazing Incidence X–ray Scattering," P.R. Besser, R. Venkatraman, S. Brennan and J.C. Bravman, Proc. of the Materials Research Society #239; 233–238 (1992).
121. "Determination of the Strain Distributions in Aluminum Thin Films as a Function of Temperature by the Use of Synchrotron Grazing Incidence X–ray Scattering," R. Venkatraman, P.R. Besser, S. Brennan and J.C. Bravman, Proc. of the Materials Research Society #239; 227–232 (1992).
122. "An Anodic Process for the Determination of Grain Boundary and Film Thickness Strengthening Effects in Aluminum Films on Oxidized Silicon," R. Venkatraman and J.C. Bravman, Proc. of the Materials Research Society #239; 127–132 (1992).
123. "Microstructural Issues found in c–Parallel YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7– $\delta$</sub>  Thin Films," S.K. Streiffer, B.M. Lairson, E. Zielinski, T. Umezawa, T. H. Geballe and J.C. Bravman, Proc. of the Electron Microscopy Society of America, 50th Annual Mtg, G. W. Bailey; 240–241 (1992).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

124. "Transmission Electron Microscopy and X-ray Diffraction Studies of a,b-Axis Oriented  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  Thin Films," S.K. Streiffer, B.M. Lairson, E. Zielinski, and J.C. Bravman, Proc. of the Materials Research Society #275; 771-776 (1993).
125. "X-ray Observation of Stress Gradients and Precipitation in Passivated Al-0.5%Cu Films," P.R. Besser, S. Brennan, and J.C. Bravman, Proceedings of the Materials Research Society #307: Application of Synchrotron Radiation Techniques to Materials Science, 161-167 (1993).
126. "Strain Relaxation and In-situ Observation of Voiding in Passivated Aluminum Lines," P.R. Besser, T.N. Marieb, and J.C. Bravman, Proc. of the Materials Research Society, #308, 249-254 (1993).
127. "Non-destructive Evaluation of Strains and Voiding in Passivated Copper Metallizations," R.P. Vinci, T.N. Marieb and J.C. Bravman, Proc. of the Materials Research Society, #308, 297-302 (1993).
128. "X-ray Determination and Finite-Element Modeling of Stress in Passivated Al Lines During Thermal Cycling," P.R. Besser, A. Sauter-Mack, D. Fraser, and J.C. Bravman, Proceedings of the Materials Research Society #309, 287-292 (1993).
129. "Stress Gradient and Relaxation Measurements in Al and Oxygen Implanted Al Films," P.R. Besser, S. Bader, R. Venkatraman and J.C. Bravman, Proceedings of the Materials Research Society, #308, 323-328 (1993).
130. "Stress in Copper Thin Films with Barrier Layers," R.P. Vinci and J.C. Bravman, Proceedings of the Materials Research Society #308, 337- 341 (1993).
131. "X-ray Determination of Strains, Stresses and Relaxation in Interconnection Metallizations," Proc. of the Second International Workshop on Stress Induced Phenomena in Metallizations, AIP Conference Proc. Series, 305, 46-61 (1994).
132. "Direct Observation of the Growth and Movement of Electromigration Voids under Passivation," T.N. Marieb, E. Abratowski, J.C. Bravman, M. A. Madden and P.A. Flinn, Proc. of the Second International Workshop on Stress Induced Phenomena in Metallizations, AIP Conference Proc. Series, 305, 1-14 (1994).
133. "Measurement and Interpretation of Strain Relaxation in Passivated Al-0.5% Cu Lines," P.R. Besser, T.N. Marieb, J.C. Bravman and P.A. Flinn, Proceedings of the Materials Research Society, 338, 275-80 (1994).
134. "Microstructural Characterization of Copper Thin Films on Metallic Underlayers," E.M. Zielinski, R.P. Vinci, and J.C. Bravman, Proceedings of the Materials Research Society #338, 307-12 (1994).
135. "Thermal Stresses in Passivated Copper Interconnects Determined by X-ray Analysis and Finite Element Modeling," R.P. Vinci, E.M. Zielinski, and J.C. Bravman, Proceedings of the Materials Research Society #338, 289-94 (1994).
136. "In-Situ Observations of Voiding in Metal Lines Under Passivation," T.N. Marieb, J.C. Bravman, P. Flinn, and M. Madden, Proceedings of the Materials Research Society #338, p. 409-413 (1994).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

137. "A New Model for the Anomalous Diffusion of Grown-In Magnesium in GaAs," Y. M. Haddara, M.D. Deal, H. G. Robinson, J.C. Bravman, Proceedings of SOTAPOCS XXI, 96-106, Electrochemistry Society p. 96-106 (1995).
138. "Diffusion of implanted Be in  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  as a function of Al concentration," C.C. Lee, M.D. Deal, J.C. Bravman, Proceedings of SOTAPOCS XXI, 96-106, Electrochemistry Society p. 85-95 (1995).
139. "The Effects of Processing on the Microstructure of Copper Thin Films on Tantalum Barrier Layers," E.M. Zielinski, R.P. Vinci, and J.C. Bravman, Proceedings of the Materials Research Society #391, p. 303-8 (1995).
140. "The Influence of Strain Energy Minimization on Abnormal Grain Growth in Copper Thin Films," E.M. Zielinski, R.P. Vinci, and J.C. Bravman, Proceedings of the Materials Research Society #391, p. 103-8 (1995).
141. "A simple analysis of average mechanical behavior and strain energy density of misoriented grains in a textured film," R.P. Vinci, T.P. Weihs, E.M. Zielinski, T. W. Barbee, J.C. Bravman, Proceedings of the Materials Research Society #391, p. 97-102 (1995).
142. "Finite Element Modeling of Grain Aspect Ratio and Strain Energy Density in a Textured Copper Thin Film," R.P. Vinci, and J.C. Bravman, Proceedings of the Materials Research Society #436, p. xx-xxx (1995).
143. "Modeling the Transient Diffusion Behavior of Beryllium in Gallium Arsenide and the Effect of Encapsulant Material on Non-Equilibrium Point Defect Populations," Fourth International Symposium on Process Physics and Modeling, in press (1996).
144. "Observations of Electromigration Voiding in Copper Lines," S.H. Lee, J.C. Bravman, P.A. Flinn, and L. Arnaud, Proceedings of the Materials Research Society #xxx, in press (1997).
145. "Comparison of Stresses in Al Lines Under Various Passivations," S. Lee, J.C. Bravman, P.A. Flinn, and T.N. Marieb, Proceedings of the Materials Research Society #xxx, in press (1997).
146. "In-Situ Stress Measurements during Dry Oxidation of Silicon," C. Yu, P.A. Flinn, and J.C. Bravman, Proceedings of the Materials Research Society #xxx, in press (1997).
147. "A High Voltage Scanning Electron Microscope for the In-Situ Observation and recording of Electromigration Voids in Metal Lines on Integrated Circuits," P.A. Flinn, S. Lee, J.C. Doan, J.C. Bravman, T. Marieb, and M.C. Madden, Proceedings: Microscopy and Microanalysis '97, #3 (Supplement 2), p. 615-16 (1997).
148. "A Quantitative Study of Void Nucleation Times in Passivated Aluminum Interconnects," J. C. Doan, J. C. Bravman, P. A. Flinn and T. N. Marieb, Proceedings of the Materials Research Society, 516, 83-88 (1998).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

149. "Comparisons of constraint effects on Al lines under various passivations," S. Lee, J. C. Bravman, P. A. Flinn, and T. N. Marieb, AIP Conf. Proc. Series, 418, 277 (1998).
150. "Void phenomena in passivated metal lines: Recent observations and interpretation," P. A. Flinn, S. Lee, J. Doan, T. N. Marieb, J. C. Bravman, and M. Madden, AIP Conf. Proc. Series, 418, 250 (1998).
151. "Comparison of electromigration behavior in passivated aluminum interconnects," S. Lee, J.C. Doan, J. C. Bravman, P. A. Flinn, T. N. Marieb, and S. Ogawa, AIP Conf. Proc. Series, 418, 101 (1998).
152. "Comparison of Electromigration Behavior in Passivated Aluminum Interconnects," S. Lee, J. Doan, J.C. Bravman, P.A. Flinn, T.N. Marieb, and S. Ogawa, Proceedings of the Fourth International Workshop on Stress Induced Phenomena in Metallizations, AIP Conference Proc. Series #xxx, p. 101–106 (1998).
153. "Void Phenomena in Passivated Metal Lines: Recent Observations and Interpretation," P.A. Flinn, S. Lee, J. Doan, T.N. Marieb, J.C. Bravman, and M. Madden, Proceedings of the Fourth International Workshop on Stress Induced Phenomena in Metallizations, AIP Conference Proc. Series #xxx, p. xxx (1998).
154. "Determination of Temperature Dependent Unstressed Lattice Spacings in Crystalline Thin Films on Substrates," G. Cornella, S. Lee, O. Kraft, W.D. Nix, and J.C. Bravman, Proceedings of the Materials Research Society, 505 p. 527–32 (1998).
155. "An In-situ Stress Sensor for Vapor-phase Thin Film Deposition," P. Zhang, R. P. Vinci, J.C. Bravman, and T. Kenny, Proceedings of the Materials Research Society, 546, p. xxx–xx (1999).
156. "Observations of Low Cycle Fatigue of Al Thin Films for MEMS Applications," G. Cornella, R.P. Vinci, R. Suryanarayanan, R.H. Dauskardt, and J.C. Bravman, Proceedings of the Materials Research Society, 518 p. xxx–xx (1999).
157. "The Effects of Environment and Fatigue on the Adhesion and Subcritical Debonding of Dielectric Polymers," J.M. Snodgrass, D. Pantelidis, J.C. Bravman, and R.H. Dauskardt, Proceedings of the Materials Research Society, 565 p. xxx–xx (1999).
158. "Electromigration Voiding in Argon-Implanted Interconnects," N.E. Meier, J.C. Doan, T.N. Marieb, P.A. Flinn, and J.C. Bravman, Proceedings of the Materials Research Society, xxx p. xxx–xx (1999).
159. "A Detailed Study of Void Motion in Passivated Aluminum Interconnects," J.C. Doan, J.C. Bravman, P. A. Flinn, and T.N. Marieb, Proceedings of the Materials Research Society, xxx p. xxx–xx (1999).
160. "The Relationship Between Resistance Changes and Void Volume Changes in Passivated Aluminum Interconnects," J.C. Doan, J.C. Bravman, P.A. Flinn and T.N. Marieb, Proceedings of the 37<sup>th</sup> Annual International Reliability Physics Symposium, IEEE Press, p. 206-212 (1999).

**Silicon Valley Expert Witness Group, Inc.**  
**Consultant Curriculum Vitae**

161. "Effect of Microstructure and Chemical Bonding on the Adhesion Strength of a Silicon/Polymer Interface for Microelectronic Packaging Applications," D. Pantelidis and J.C. Bravman, Proceedings of the Materials Research Society, xxx p. xxx-xx (1999).
162. "Direct Measurements of Nucleation Times and Growth Rates of Electromigration-Induced Voids, Proceedings of the Fifth International Workshop on Stress Induced Phenomena in Metallizations, AIP Conference Proc. Series #xxx, p. xxx (1999).
163. "Atomic Force Microscopy Studies of Fracture Surfaces From Oxide / Polymer Interfaces," M. Jenkins, J. Snodgrass, A. Chesterman, R. Dauskardt, and J. C. Bravman, Proceedings of the Materials Research Society, xxx p. xxx-xx (2001).

**EDITED WORKS**

1. Specimen Preparation Techniques for Transmission Electron Microscopy of Materials, J.C. Bravman, R. M. Anderson and M. L. McDonald, editors; Volume 115, Symposium Proceedings, Materials Research Society (1988).
2. Thin Films: Stresses and Mechanical Properties, J.C. Bravman, W.D. Nix, D. M. Barnett and D. A. Smith, editors; Volume 130, Symposium Proceedings, Materials Research Society (1989).
3. Laser Ablation for Materials Synthesis, D. C. Paine and J. C. Bravman, editors; Volume 191, Symposium Proceedings, Materials Research Society, (1990).
4. Specimen Preparation Techniques for Transmission Electron Microscopy of Materials III, R. M. Anderson, B. Tracey and J. C. Bravman, editors; Volume 254, Symposium Proceedings, Materials Research Society (1992).
5. Thin Films: Stresses and Mechanical Properties III, W.D. Nix, J.C. Bravman, L. B. Freund and E. A. Arzt, editors; Symposium Proceedings, Materials Research Society (1992).
6. Guest Editor: July, 1992 Issue of the Materials Research Society Bulletin; "Mechanical Properties of Thin Film Materials."
7. Stress-Induced Phenomena in Metallization, P. S. Ho, J. C. Bravman, C. Y. Li, J. Sanchez, editors; Volume 373, AIP Conference Proceedings (1995).
8. Materials Reliability for Microelectronics VIII, J. C. Bravman, T. N. Marieb, J. R. Lloyd, M. A. Korhonen, editors; Volume 516, Symposium Proceedings, Materials Research Society (1998).

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