February 27 - March 1, 2002
Santa Clara Marriott Hotel
Santa Clara, CA

2002 PROCEEDINGS
SEVENTH INTERNATIONAL
CHEMICAL-MECHANICAL
PLANARIZATION
FOR
ULSI MULTILEVEL
INTERCONNECTION
CONFERENCE
(CMP-MIC)

A SPECIALTY CONFERENCE OF

2002 MICROELECTRONICS
INSTITUTE ON-CHIP
INTERCONNECTION

Library of Congress No.
89-644090
SESSION I - 8:15 A.M.

KEYNOTE ADDRESS

SEMICONDUCTOR INDUSTRY REPRESENTATIVES:

"WHAT OUR COMPANY NEEDS FROM CMP IN THE NEAR FUTURE"

* INTEL
  Mansour Moinpour
  Santa Clara, California

* MOTOROLA
  Janos Farkas
  Austin, Texas

* HEWLETT PACKARD
  Michael Monroe
  Corvallis, Oregon

* LSI LOGIC
  Peter Burke
  Santa Clara, California

SESSION II - 10:30 A.M. - 12 Noon

VLSI MULTILEVEL INTERCONNECTION

C.M.P. CONDUCTOR PROCESSES - Part I

Chairman: Dr. Michael Fury
EKC TECHNOLOGY
Hayward, California


2.B "The Development of a Production Worthy Chemical-Mechanical Polishing Process for 0.13 micron Technology Node With Copper/Spin-on-Dielectric Low-k Interconnection" by Hsu-Chung Chen, Shih-Hsun Hsu, Shao-Chung Hu, Chia-Lin Hsu, Wen-Yi Hsieh and Po-Wen Yen; UNITED MICRO CORP; Taiwan, R.O.C

Invited Paper
2.C "The Impact of Inhibitor Levels on Corrosion During Copper Chemical Mechanical Polish" by Mona Eissa, Lindsey Hall, Nilesh Doke, Satyavolu Papa Rao; TEXAS INSTRUMENTS; Dallas, TX; and Ashutosh Misra and Matthew Fisher; AIR LIQUIDE ELEC; Dallas, TX........ 30

2.D "A Study on the Solid Content of Silica Slurry for Advanced Copper/Low-k Interconnection" by Shih-Hsun Hsu, Chia-Lin Hsu, Shao-Chung Hu, Fu Yang, Hsueh-Chung Chen, Wen-Yi Hsieh and Po-Wen Yen; UNITED MICROELECTRONICS COPR; Taiwan, R.O.C.................. 36

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2.E "A Novel Approach to Improve Uniformity of Copper Chemical-Mechanical Polish on Linear Polisher" by W. C. Chiu, H. H. Kuo, S. M. Jang, C. H. Yu and M. S. Liang; TAIWAN SEMI MFG CO; Taiwan, R.O.C.................. 43

SESSION III - 1:30 - 3:40 P.M.
VLSI MULTILEVEL INTERCONNECTION
CMP MODELING & SIMULATION - Part I
and CMP CONSUMABLES - Part I

CMP MODELING & SIMULATION
Part I

Chairman: Dr. Frank Kaufman
CABOT MICROELECTRONICS
Aurora, Illinois

3.A "Material Removal Regions in Chemical-Mechanical Polish: Coupling Effects of Slurry Chemicals, Abrasive Size Distribution and Wafer-Pad Contact Area*" by Jianfeng Luo, Serdar Aksu and David Dornfeld; UNIVERSITY of CALIFORNIA; Berkeley, CA........ 49

Invited Paper

3.B "Numerical Investigation of the Effect of Pad Groove in Chemical Mechanical Planarization Process" by Wes Jeng; ASIA IC MIC-PROCESS; Taiwan, R.O.C.; and Jian J. Yeuan, Shih H. Lin; FENG CHIA UNIV; Taiwan, R.O.C 59

3.C "Effects of Viscoelastic Pad Deformation on Material Removal Rate in Chemical Mechanical Polishing" by Guanghui Fu and Abhijit Chandra; IOWA STATE UNIV; Ames, IA.................. 67

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3.D "In-situ Electrochemical and Mechanical Measurements to Understand the Chemical Mechanical Polishing Phenomena" by Seung-Mahn Lee, Wonsoop Choi and Rajiv K. Singh; UNIV of FLORIDA; Gainesville, FL........ 77

3.E "Enhancement of the Pad Profile and Lifetime Using Pad Conditioning Simulation With Disk Sweep Rate" by Hyung-Soon Park, Jae-Hoon Choi, Woo-Jin Lee, Yong-Soo Choi, Sang-Ick Lee and Hyun-Chul Sohn; HYNIX SEMI; Kyung-Do, KOREA................................. 81

3.F "Modeling of the Material Removal for Fixed Abrasive Chemical Mechanical Planarization *" by Cyriaque Sukam, Jongwon Seok, Andrew T. Kim, John A. Ticky and Timothy S. Cale; RENSSELAER POLYTECH INST; Troy, N.Y... 85
CMP CONSUMABLES

Part 1

3.G "Comparison of Two Different Conditioning Disk Designs in Reference to Cost of Ownership of Tungsten Chemical Mechanical Planarization" by Andreas Haacker, Matthias Zellmer and Georg Morsch; PETER WOLTERS CMP SYS; Rendsburg, GERMANY................................................................. 91

3.H "Characteristics of Slurry Including Phosphoric Acid for Chemical Mechanical Planarization of Copper and Tantalum Nitride" by Jong-Heun Lim, Min-Ho Kim, Jong-Dai Park and Chan-Sook Park; DONGJIN SEMICHEM CO; Kyungki-Do, KOREA................................................................. 98

3.1 "A Novel Low Pressure High Selectivity Barrier Metal Slurry" by Jinru Bian; RODEL; Newark, DE................................. 105

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3.J "Evaluation of 200 mm MPTI Floating Head With Varied Consumables" by H. M. Wang, G. Moloney, Cormac Walsh and Alex Reyes; MULTI PLANAR TECH; San Jose, CA................................................................. 111

3.K "Utilizing Advanced Pad Conditioning and Pad Motion in Tungsten Chemical Mechanical Planarization" by Sang-Yong Kim, Yang-Won Lee, Jae-Deok Jeong, SangChul Shim, KwangHa Suh and Jeong Lee; ANAM SEMI; Kyunggi-Do, KOREA................................................................. 115

3.L "Impact of Diamond Conditioning Disk Characteristics on Removal Rates of Polyurethane Polishing Pads" by Mark Bubnick, Sohail Qamar, Thomas Namola and Dave McClew; ABRASIVE TECH. INC; Lewis Center, OH................................. 119

3.M "Regeneration of Used Oxide Slurry and Its Application to Oxide Chemical-Mechanical Planarization" by Myoung-Shik Kim, Sang-Ho Lee, Jin-goo Park; HANYANG UNIV; Ansan, KOREA; Kwang-Jun Lee and Roh-Young Sung; NEW-YOUNG M TECH; KOREA; and Sun-Woong Woo and Bong-Chun Kim; HYNIX SEMI; Kyunggi-Do, KOREA................................................................. 124

SESSION IV - 3:55 - 5:05 P.M.
VLSI MULTILEVEL INTERCONNECTION
C.M.P. NOVEL APPLICATIONS

Chairman: Dr. Peter Burke
LSI LOGIC
Santa Clara, California

4.A "Novel Chemical-Mechanical Planarization Applications and Challenges" by David J. Stein; SANDIA NAT’L LABS; Albuquerque, NM................................................................. 131

Invited Paper

4.B "The Haze Free Polishing Process of 12 inch Wafers as a Part of Wafer Re-Claiming" by Hella Moller and Georg Morsch; PETER WOLTERS CMP SYS; Rendsburg, GERMANY; and David Lewis; PURE WAFER; Swansea, UNITED KINGDOM................................................................. 132
Thursday, February 28, 2002

SESSION V  9 - 10 A.M.
VLSI MULTILEVEL INTERCONNECTION
CMP CONSUMABLES - Part II

Chairman:  Dr. Tamba Tugbawa
M. I. T.
Cambridge, Massachusetts

5.A “Filtration of Chemical Mechanical Polishing Slurry Using Pleated and Depth Filters and Its Impact on Product Yields” by Holly Linkowich; FILTERITE ELECTRONICS; Timonium, MD; and Jeffrey Sultemeier; MOTOROLA; Austin, TX

5.B “Evaluation of a Pattern Selectivity in Fixed Abrasive Pad Using Hydrophilic Polymer” by Ho-Youn Kim, Jae-Hong Park, Hae-Do Jeong; PUSAN NAT’L UNIV; Pusan, KOREA

5.C “Well Controlled Abrasive Assure Successful Chemical Mechanical Planarization Operation” by Robert Her, Eric Oswald, Brian Edelbach and John Givens; FERRO ELECTRONIC MAT’L; Peon Yan, N.Y.; and Josh Tucker; SAMSUNG SEMI; Austin, TX

--- POSTER PAPERS ---

5.D “The Pad Life and Performance Study of Tungsten Chemical Mechanical Planarization Processes” by Pao-Kang Niu, TAIWAN SEMI MFG CORP; Taiwan, R.O.C.

5.E “Integrated Chemical Mechanical Planarization Barrier Slurry Development To Achieve Adjustable Rate Selectivities” by Qianqiu Ye, John Quanci, Matthew VanHanehem and Terrence Thomas; RODEL; Newark, DE.

SESSION VI - 10:15 - 12:15 P.M.
VLSI MULTILEVEL INTERCONNECTION
CMP CLEANING PROCESSES & CMP INSTRUMENTATION & HARDWARE

Chairman:  Dr. Rodney Morad
APPLIED MATERIALS
Santa Clara, California

CMP CLEANING PROCESSES

6.A “Defect Issues in Chemical Mechanical Planarization” by Paul Feeney; CABOT CORP; Aurora, IL

Invited Paper

6.B “Reduction in the Polishing Residue and Micro Dishing Induced During the Plug Isolation Chemical Mechanical Planarization Using Acidic Slurry” by Hyung-Soon Park, Pan-Ki Kwon, Woo-Jin Lee, Ki-Chul Ahn, Sang-Ick Lee, Yong-Soo Choi and Hyun-Chul Sohn; HYNIX SEMI; Kyunggi-Do, KOREA
6.C “Supramolecular Design of Abrasive-Free Chemical Mechanical Planarization for Copper/ SiLK Integration” by Lirong Guo, Jason Keleher, Craig Burkhard, Adam Batchellor and Yuzhuo Li; CLARKSON UNIV; Potsdam, N.Y.; Charles B. Little; SACHEM; Austin, TX.................. 188

Invited Paper

6.D “Benefits of Point-of-Use Blending on Chemical Mechanical Polishing Slurry Pot Life” by Brandon Scott, Cass Shang and Bob Small; EKC TECHNOLOGY; Hayward, CA; and John V. Pozniak, Katherine Hutchison, Peter M. Pozniak and Rakesh K. Singh; BOC EDWARDS; Santa Clara, CA.............................................. 193

6.E “Tribological Aspects in Chemical Mechanical Polishing” by Hyoung-Jae Kim, Dae-Hee Kwon and Hae-Do Jeong; PUSAN NAT’L UNIV; Pusan, KOREA; and Eung-Sug Lee and Young-Jae Shin; KOREA INST of MACHINERY & MAT’L; Taejon, KOREA........................................... 201

6.F “Control of Critical Pressure and Adhesion Strength in Copper and Low Dielectric Constant Layer in Chemical Mechanical Planarization” by Tohru Hara, Hiroki Toida and Fumiaki Togoh; HOSEI UNIV; Tokyo, JAPAN........ 209

6.G “Friction Induced Chemical Interaction During Chemical Mechanical Polishing - A New Removal Mechanism” by Hong Liang, UNIV. of ALASKA; Fairbanks, ALASKA and Thierry LeMogne, Jean-Michel Martin; ECOLE CENTRAL DE LYON; Lyons, FRANCE.................. 216

Invited Paper

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6.H “Understanding and Addressing Total Wafer Removal Rate NonUniformities” by Travis R. Taylor and Shan C. Xu; LAM RESEARCH; Fremont, CA........ 225

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6.I “Chemical Mechanical Planarization Process Control Via In-Situ and Real Time Chemical Endpoint Detection” by Matthias Handke; INFINEON TECH; Dresden, GERMANY; and Werner Moser; ECO PHYSICS AG; Durten, SWITZERLAND................................. 231

SESSION VII - 1:15 P.M. - 2:15 P.M.
VLSI MULTILEVEL INTERCONNECTION
DEDICATED TIME FOR CMP
POSTER PAPERS, EXHIBIT VIEWING

SESSION VIII - 2:15 - 5:00 P.M.
VLSI MULTILEVEL INTERCONNECTION
C.M.P. CONDUCTOR PROCESSES - Part II

Chairman: Dr. Rod Kistler
LAM RESEARCH CORP
Fremont, California

8.A “Chemical Mechanical Planarization: Aiming for Perfect Planarization” by Patrick Ledue; CEA-LETI; Grenoble, FRANCE; Pascal Berar and Haruki Nojo; EKC TECH; Kawasaki; JAPAN; Jean-Francois Lugand; ST MICRO; Mylan, FRANCE.................. 239
8.B "Improved Direct Polish Shallow Trench Isolation Chemical Mechanical Planarization Process With High Selectivity Slurry: Reduced Microscratching and Increased Productivity" by Benjamin A. Bonner, Deepak Kumar, Anand Iyer, Thomas H. Osterheld and Annabel S. Nickles; APPLIED MATERIALS; Santa Clara, CA


8.D "Production Worthy Bonded Abrasive Direct Shallow Trench Isolation Chemical Mechanical Planarization for Sub-0.18 micron Applications" by Carlton D. Ollison and Keith G. Pierce; ATMEL CORP; Irving, TX

8.E "Deep Sub-Micron Scale Shallow Trench Isolation Chemical Mechanical Planarization Planarity Analysis" by K.C. Wu, Karen Wong, Wei-Han Chan, David Lui and Ching-Hwa Chen; MOSEL VITELIC; San Jose, CA

8.F "Fixed Abrasive and Selective Chemistries: Some Real Advantages for Direct Shallow Trench Isolation Chemical Mechanical Planarization" by John Gagliardi, Richard Webb and Chris Rueb; 3M CENTER; St Paul, MN

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8.G "A Study on Shallow Trench Isolation Chemical Mechanical Planarization for 0.10 micron Technology Node" by Zong-Huei Lin, Art Yu, Fu Yang, Hsueb-Chung Chen, Wen-Yi Hsieh and Po-Wen Yen; UNITED MICROELECTRONICS CORP; Taiwan, R.O.C

8.I "New Family of Agents for High Selectivity in Ceria-Based Shallow Trench Isolation Chemical Mechanical Planarization" by Eric Oswald, Brian Edelbach and Bob Her; FERRO ELECTRONIC MAT'L; Penn Yan, N.Y

Friday, March 1, 2002

SESSION IX - 9:00 - 10:20 A.M.

VLSI MULTILEVEL INTERCONNECTION
C.M.P. DIELECTRIC PROCESSES

Chairman: Dr. David Stein
SANDIA NAT'L LABS
Albuquerque, New Mexico

9.A "Chemical Mechanical Planarization System Using Fixed Abrasive (FX-CMP) for Dielectric Planarization" by Souichi Katagiri, K. Yasui, Y. Kawamura, U. Yamaguchi, M. Nagasawa, F. Kansai, R. Kawai and M. Tokuda; HITACHI; Tokyo, JAPAN; S. Moriyama; INST. of TECHNOLOGY; Tokyo, JAPAN; and Y. Tanaka, M. Honda and N. Yamada; NIHON KOKUSO KENTO CO; Tokyo, JAPAN

9.B "Development for Low-k/Barrier Layer Slurries" by Nichole Koontz, Gert Moyaerts, Richard Jenkins, Saeed Mohseni and Deepak Mahulikar; PLANAR SOLUTIONS; Queen Creek, AZ
9.C "Automated Process Control of Within-Wafer and Waferto-Wafer Uniformity in Oxide Chemical Mechanical Planarization" by Jimin Zhang, Joseph Paik, Brian Lusher, Brian Brown, Sidney Huey, Moshe Sarfaty, Arulkumar Shanmugasundram, Alexander Schwarm and Annabel S. Nickles; APPLIED MATERIALS; Santa Clara, CA

9.D "Pad Conditioning and Removal Rate Stability in Oxide Chemical Mechanical Planarization" by A. Scott Lawing; RODEL; Phoenix, AZ

--- POSTER PAPERS ---


9.F "Evaluation of ESM-U Pad With Varied Silica Slurries for Oxide Chemical Mechanical Polishing Process" by H. M. Wang and G. Maloney; MULTI PLANAR TECH; San Jose, CA; G. Duncan; UNIVERSAL PHOTONICS; Folsom, CA

SESSION X - 10:35 A.M. - 12 P.M.
VLSI MULTILEVEL INTERCONNECTION
C.M.P. CONDUCTOR PROCESSES - Part II

Chairman: Dr. Kathleen Perry
CABOT MICROELECTRONICS
Aurora, Illinois

10.A "The Dynamic Slurry and Tungsten Chemical Mechanical Polishing Process Monitor Method and Auto Tuning System Study" by Shui-Hung Chen, Mu-Chi Chiang, L. J. Hung and Pao-Kang Niu; TAIWAN SEMI MGF CO; Taiwan, R.O.C

10.B "Minimization of Metal Loss During Chemical Mechanical Planarization of Copper Oxide and Copper Low-k Damascene Structures" by Kapila Wijekoon, Yongsik Moon, Shijian Li, Wei-Yung Hsu and Suketu Parikh; APPLIED MATERIALS; Santa Clara, CA

10.C "Improved TiN Liners for Enhanced Tungsten Chemical Mechanical Planarization Endpoint Detection" by V. Fortin, K.C. Wu, D. Avalos and D. Lui; MOSEL VITELIC CORP; San Jose, CA

CMP-MIC LUNCHEON - 12:00 - 2:00 P.M.
"COPPER POLISHING WITH DIELECTRIC CONSTANTS LESS THAN 2.8: CHALLENGES & SOLUTIONS"
Dr. Jayanthi Pallinti
LSI LOGIC CORP.
Research & Development Division
Santa Clara, California
SESSION XI - 2:00 P.M. - 4:00 P.M.
VLSI MULTILEVEL INTERCONNECTION
C.M.P. CLEANING PROCESSES &
CMP INSTRUMENTATION & HARDWARE

Chairman: Dr. Philip Fleming
P. H. FLEMING & ASSOC.
Colorado Springs, Colorado

CMP CLEANING PROCESSES

11.A "Analysis of Removal of Particles During Post Chemical Mechanical Polishing Cleaning" by Tinggang Zhang, Jonah Lee and Hong Liang; Univ of ALASKA; Fairbanks, AK; and Kris Bahlen; RIPPEY CORP; El Dorado Hills, CA... 351

11.B "Post Chemical Mechanical Polish Cleaning of High Selectivity Slurry for Shallow Trench Isolation CMP" by Hugh Li, Joseph Li and Diane Hymes; LAM RESEARCH; Fremont, CA. 359

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11.C "An Intuitive Model for Integration of Closed-Loop-Control for Copper Chemical Mechanical Planarization Using In Situ Metrology" by Mark Meloni; VERITY INSTRUMENTS; Carrollton, TX... 367

11.D "Next Generation Scratch and Corrosion Free Conditioner for Chemical Mechanical Planarization" by Jum-Yong Park, Yi-Koan Hong, Myoung-Shik Kim and Jun-Goo Park; Hanyang Univ; Ansan, Korea; and Sung Ko; Hunatech Co; Daejun, Korea; and Sang-Ick Lee; Hynix Semi; Ichon-si, Korea. 375

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11.E "Evaluation of 200 mm MPTI Floating Head With Pressure Zone Control" by H. W. Wang, G. Moloney, Cormac Walsh and Alex Reyes; Multi Planar Tech; San Jose, CA.; and Huey-Ming Wang; Ebara Tech; San Jose, CA. 385

11.F "Improvements in Edge Polishing Control Through Advances in Carrier Head Technology" by David A. Hansen, Yoichi Shiosaka, Brian Stephenson and David Watts; Ebara Tech; San Jose, CA. 385

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11.G "Metrology Data Sharing Between Process Steps in a High Volume Manufacturing Environment Utilizing NovaScan System, NovaNet and Nova Engineering Station" by Avron Ger and Oved Or; Nova Measuring Instruments; Rehovoth, Israel. 39