

Table of Contents

Session A: CMP Fundamentals

- 1 **Electrochemical study of SiGe in different alkaline chemical formulations** 19
S. Yang, B. Zhang, Y. Liu, C. Wang (Hebei University of Technology, P.R. China)
- 2 **Modified Kinematic Model for Predicting Contact Points of Conditioner in CMP ...** 24
J. Choi, E. Kim, C. Shin, Y. Jin, T. Kim (Sungkyunkwan University, Korea)
- 3 **In situ imaging of local corrosion cells on copper fine wires in solutions** 27
C. Takatoh¹, S. Ogata^{1,2}, T. Kitagawa², T. Okamoto², U. Megumi¹, S. Shima¹,
A. Fukunaga¹, T. Fukuma²
¹(EBARA Corporation, Japan); ²(Kanazawa University, Japan)
- 4 **Novel Method for Ultra Rapid Determination of the Lubrication Mechanisms in Tungsten, Copper, STI and ILD CMP** 31
R. Han, M. Bahr, Y. Sampurno, A. Philipossian (University of Arizona, USA)

Session B: BEOL

- 5 **Study on effect of different complexing agents and inhibitors on Co corrosion in H₂O₂ based alkaline solution by EQCM (Invited)** 32
P. He, G. Yang, X.-P. Qu (Fudan University, P.R. China)
- 6 **CMP process development for radiation detector fabrication** 37
I. Schubert¹, K.-D. Preuß²; M. Feltz², T. Wittig², K. Gottfried¹
¹(Fraunhofer ENAS, Germany); ²(CiS Forschungsinstitut für Mikrosensorik GmbH, Germany)
- 7 **Investigation of Mass Transfer Speed Theory on chemical mechanical polishing** 38
Y. Liu, Y. Li, C. Wang, L. Yang, J. Wang (Hebei University of Technology, P.R. China)
- 8 **Effect of Guanidine Sulfate on the CMP of Ru in H₂O₂ Based Slurry** 46
G. Yang, P. He, X.-P. Qu (Fudan University, P.R. China)
- 9 **Effect of Deposition Methods on Material Removal Rate During Nickel CMP** 48
Y. Wang^{1,2}, L. Teugels¹, K. Vandersmissen¹, S. De Gendt¹, S. Krishnan², H. Struyf¹
¹(IMEC, Belgium); ²(Clarkson University, USA)

Session C: Defects

- 10 Study on Fullerol as the Additive to Remove BTA Film Remaining on Copper Surface in Chemical Mechanical Polishing Process 54**
Y. Hsun Tsai, K. Suzuki, A. Chen (National Taiwan University of Science and Technology, Taiwan)
- 11 Density Evaluation of Sub-100 nm Particles by Using Ellipsometry 60**
E. Kondoh, K. Suzuki, L. Jin (University of Yamanashi, Japan); S. Hamada, S. Shima, H. Hiyama (Ebara Corporation, Japan)
- 12 Measurement of Removal Force in DI-Water for Fine Particles with Sub-NanoNewton Resolution 65**
S. Shima, S. Hamada, C. Takatoh, Y. Wada, A. Fukunaga, H. Sobukawa (Ebara Corporation, Japan)
- 13 BEoL post CMP cleaning challenges for 22 nm FD-SOI and beyond 71**
J. Koch¹, S. Rehschuh¹, L. Gerlich¹, A. Dhavamani¹, P. Steinke¹, R. Krause¹, J. Naue¹, S. Bott¹, B. Vasilev², D. Breuer², R. Seidel², A. Preusse², J. W. Bartha³, B. Uhlig¹
¹(Fraunhofer IPMS, Germany); ²(Globalfoundries Module One LLC Co. KG, Germany);
³(Dresden University of Technology, Germany)

Session D: Equipment, CMP Fundamentals

- 14 In-line Atomic Resolution Local Nanotopography Variation Metrology for CMP Process (Invited) 77**
T.-G. Kim, N. Heylen, S.-W. Kim, T. Vandeweyer (IMEC, Belgium); A.-J. Jo, J. S. Lee, B.-W. Ahn, S.-J. Cho, S.-I. Park (Park Systems, Korea); B. Irmer, S. Schmidt (Nanotools GmbH, Germany)
- 15 Advanced Optical Particle Sizing for Non-Invasive Slurry analysis 83**
R. Mavliev (Ipgrip LLC, USA)
- 16 Novel Method for Nano-Surface Analysis of Cu CMP Chemicals by AFM and Microfluidic Chip System 88**
H.-Y. Ryu¹, K.-M. Han¹, B.-J. Cho¹, S. Shima², S. Hamada², H. Hiyama², T.-G. Kim³, J.-G. Park¹
¹(Hanyang University, Korea); ²(Ebara Corporation, Japan); ³(IMEC, Belgium)
- 17 Theoretical and experimental approach of swing arm conditioner for prediction of pad profile in CMP 94**
H. Kim, H. Cho, C. J. Park (Korean Institute of Industrial Technology, Korea); H. Jeong (G&P Technology, Korea); S. Shin (KCTECH, Korea)
- 18 Improvement of Material Removal Efficiency by Optimization of Anisotropic Contact of Pad Asperities 95**
N. Suzuki¹, S. Oshika¹, H. Misono¹, Y. Hashimoto^{1,2}, H. Yasuda³, Y. Mochizuki³
¹(Nagoya University, Japan); ²(Kanazawa University, Japan); ³(Ebara, Japan)

Session E: Consumables

- 19 Study on the mechanisms of Si fine polishing with water-soluble polymer 100**
Y. He (Hebei University of Technology, P.R. China)
- 20 Consumables compatibility for dielectric planarization on package substrate 103**
S. Jeong, D. Lee, H. Kim, H. Jeong, (Pusan National University)
- 21 Nano-Scale Scratch Impact on 7 nm Device and its Improvement by Predictable CMP Process Conditions 104**
J. C. Yang, D. K. Penigalapati, W. Y. Lu, T. F. Chao, A. Snyder, D. Koli (Globalfoundries, USA)
- 22 A Reverse Selectivity Ceria Slurry for Silicon Nitride Removal during CMP 105**
C. Shin¹, S. Hong², D. Kwak¹, E. Kim¹, T. Kim¹
¹(Sungkyunkwan University, Korea); ²(Department of CMP Material R&D, SKC Co., Ltd., South Korea)

Session F: CMP alt. tech Process Control

- 23 Stabilization of removal rate of silica glass on catalyst-referred etching by cleaning catalyst surface 106**
Y. Nakahira, A. Isohashi, T. Inada, D. Toh, H. Kida, S. Matuyama, Y. Sano, K. Yamauchi (Osaka University)
- 24 Stabilization of removal rate of silica glass on catalyst-referred etching by Cleaning Catalyst surface 110**
Y. Nakahira (University of Osaka, Japan)
- 25 High-efficiency Planarization of GaN Wafers by Catalyst-Referred Etching Employing Photoelectrochemical Oxidation 115**
H. Kida, A. Isohashi, T. Inada, S. Matsuyama, Y. Sano, K. Yamauchi (Osaka University)
- 26 Thermal, Tribological and Kinetic Ramifications of Ceria Slurry Dilution and Dispense Methods in STI CMP 119**
R. Han¹, M. Bahr¹, Y. Sampurno¹, L. Borucki², A. Philipossian¹
¹(University of Arizona, USA); ²(Araca, Inc., USA)
- 27 STI CMP Endpoint Robustness Improvement through Stribeck Curve Study 120**
C. Perrot¹, R. Bouis^{2,3}, N. Daventure⁴, C. Euvrard^{2,3}, V. Balan^{2,3}
¹(ST Microelectronics, France); ²(Univ. Grenoble Alpes, France); ³(CEA-Leti-MINATEC, France); ³(Applied Materials, France)

Session G: Process Control 3D

- 28 A Quantitative Analysis of Ceria CMP Microscratch for IC Yield Correlation Learning 126**
T. Lee, H. J. Kim (Globalfoundries, USA)
- 29 Device pattern impact on optical endpoint detection by interferometry for STI CMP 127**
S. Bourzgui^{1,2,3}, A. Roussy¹, J. Blue¹, G. Georges², E. Faivre³, K. Labory³, A. Allard³
¹(Mines Saint-Etienne and LIMOS, France); ²(Aix Marseille Université, France);
³(STMicroelectronics, France)
- 30 Chase of Nanometer Topography in CMP for 3D Integration (Invited) 133**
C. Euvrard^{1,2}, Y. Exbrayat^{1,2}, C. Perrot³, A. Seignard^{1,2}, S. Mermoz³, V. Balan^{1,2}
¹(CEA-Leti-MINATEC, France); ²(Univ. Grenoble Alpes, France); ³(ST Microelectronics, France)
- 31 Nanotopography control for wafer-to-wafer hybrid bonding by CMP 135**
N. Heylen, S.-W. Kim, T.-G. Kim, L. Peng, P. Nolmans, H. Struyf, A. Miller, G. Beyer,
E. Beyne (IMEC, Belgium)

Session H: CMP Consumables, Defects

- 32 Application of Slurry Injection System (SIS) to Advanced Deep-Trench (DT) CMP (Invited) 136**
A. Jha, D. Stoll, W.-T. Tseng, C. Wu, J. Yang, (Globalfoundries, USA);
A. Philipossian (Araca Inc., USA)
- 33 Pad Surface Texture Modulation through Adapted Conditioner and Pad Intrinsic Microstructure 142**
R. Yim^{1,2,3,4}, D. Scevola³, V. Balan^{1,2}, E. Gourvest³, F. Salvatore⁴, S. Valette⁵
¹(Univ. Grenoble Alpes, France); ²(CEA Grenoble, France); ³(STMicroelectronics, France);
⁴(Université de Lyon, ENISE, France); ⁵(Université de Lyon, LTDS, France)
- 34 Chemical Generation Mechanism of Copper Flake Defects on Copper Wafer Surface from CMP Slurry and Post CMP Cleaning Chemistry 144**
B.-J. Cho¹, N. Reddy Paluvai¹, M. Purushothaman¹, J.-H. Lee¹, S. Shima², S. Hamada²,
H. Hiyama², J.-G. Park¹
¹(Hanyang University ERICA, Korea); ²(Ebara Corporation, Japan)
- 35 Formation Mechanism of Cu Flake and Ring Scratch in the Advanced Device Manufacturing 148**
S. P. Jung, S. G. Ahn, J. C. Yang, H. J. Kim, M. Kalaga, G. Yocum (Globalfoundries, USA)

Session I: Defects and Emerging

- 36 Development of Post InGaAs CMP Cleaning Process for sub 10 nm Device Application 149**
M. Purushothaman¹, I.-C. Choi¹, H.-T. Kim¹, L. Teugels², T.-G. Kim², J.-G. Park¹
¹(Hanyang University ERICA, Korea); ²(IMEC, Belgium)
- 37 Post-CMP Cleaners for Tungsten Advanced Nodes: 10 nm and 7 nm 155**
R. Lieten¹, D. White², T. Parson², S. Jenq³, D. Frye², M. White², L. Teugels⁴, H. Struyf⁴
¹(Entegris Gmbh, Germany); ²(Entegris Inc, USA); ³(Entegris Inc, Taiwan);
⁴(IMEC, Belgium)
- 38 Cherishing Old Knowledge, Acquiring New – Past, Present and Future of CMP Technology (Invited) 161**
M. Tsujimura (Ebara Corporation, Japan)
- 39 Effect of slurry additives on selectivity between polymer and Cu in advanced package substrate CMP 167**
S. Jang¹, M. Yuh^{1,2}, H. Jeong^{1,2}
¹(Pusan National University, Korea); ²(G&P Technology Inc., Korea)
- 40 Planarization of SiC wafer using photo-catalyst incorporated pad 168**
Y. Zhou, G. Pan, C. Zou, G. Luo, H. Luo (Tsinghua University, P.R. China)

Session J: CMP Fundamentals

- 41 Atomic Insights into Material Removal Mechanisms in Si and Cu Chemical Mechanical Polishing Processes: ReaxFF Reactive Molecular Dynamics Simulations (Invited) 174**
J. Wen, T. Ma, X. Lu (Tsinghua University, P.R. China); W. Zhang, A. van Duin (Pennsylvania State University, USA)
- 42 Controllable CMP of Oxide Film by Using Colloidal Ceria Slurry 177**
S. Kurokawa, T. Toyama, T. Hayashi (Kyushu University, Japan); E. Suda, J. Tokuda (Solvay Special Chem Japan, Japan)
- 43 Application of Machine Learning and Neural Networks for Generation of Pre-CMP Profiles of Advanced Deposition Processes for CMP Modeling 183**
R. Ghulghazaryan (Mentor Graphics Development Services, Armenia); J. Wilson (Mentor, A Siemens Business, USA)
- 44 A study of CMP Edge Profile for Production Wafers 189**
A. Isobe (ISTL Co., Ltd., Japan)
- 45 Chemo-Mechanical Planarization of Germanium Using Potassium Periodate based Titania Slurries 195**
A. Gupta, S. N. Victoria, R. Manivannan (National Institute of Technology Raipur, India)

Poster Session 1

- P1.1 Inline Refractive Index Replaces Auto-titration in Qualifying H₂O₂ Concentration in CMP of Tungsten 201**
K. Urquhart¹, R. Johnston², M. Kavaljer³
¹(Diversified Fluid Solutions LLC, USA); ²(Yarbrough Solutions Worldwide, USA);
³(K-Patents, Finland)
- P1.2 Characterization of incoming PVA brush by an ultrasonication break-in process 207**
J.-H. Lee¹, H.-J. Pyun¹, M. Purushothaman¹, N. R. Paluvai¹, B.-J. Cho¹, K.-M. Han¹,
S. Shima², S. Hamada², H. Hiyama², J.-G. Park¹
¹(Hanyang University ERICA, Korea); ²(Ebara Corporation, Japan)
- P1.3 Influence of Slurry Pot Life on the Removal Rate of Dielectrics and Metals 208**
R. Kumar, A. Varshney, T. S. K. Raunija, M. K. Wadhwa, S. Singh (Semi-Conductor
Laboratory, India)
- P1.4 Novel Copper Barrier Slurry for Advanced Cu CMP Process 209**
L. Chao¹, S. Hung², T. Huang¹, J. Chou², W. Yang¹, M. Luo², W. Kuo²
¹(United Semiconductor Xiamen, Taiwan); ²(Dow Electronic Materials, Taiwan)
- P1.5 Study of Post Chemical Mechanical Polishing Cleaning to Remove Particles
Through Hot Deionized Water 215**
H. Lim^{1,2}, Y. Lee², T. Kim¹
¹(Sungkyunkwan University, Korea); ²(Samsung Electronics, Korea)
- P1.6 The Behaviours of BTA and SDS in the Alkaline Slurry during the Backside
CMP of Heterogeneous Microstructure of TSV Wafers 216**
B. Q. Wang, Y. H. Liu, X. C. Lu (Tsinghua University, P.R. China)
- P1.7 Study on Hydrodynamic Pressure Distribution in Chemical Mechanical
Polishing 222**
E. Kim, C. Shin, J. Yinhua, T. Kim (Sungkyunkwan Universiy, Korea)
- P1.8 Control of Silica Particle Deposition for Fabrication of Post CMP Cleaning Ability
Evaluation Wafer 223**
Y. Cho, S.-K. Chae, C. Shin, Y. Jin, T. Kim (Sungkyunkwan University, Korea)
- P1.9 Surface Flatness and Roughness Synchronized Control in CMP Process of Silicon
Mirror 226**
B. Jiang, D. Zhao, X. Lu (Tsinghua University, P.R. China)
- P1.10 Evaluation of Competitive Reaction of Various Cu CMP Slurry Components 230**
K.-M. Han¹, B.-J. Cho¹, J.-H. Lee¹, H.-Y. Ryu¹, S. Shima², S. Hamada², H. Hiyama²
J.-G. Park¹
¹(Hanyang University, Korea); ²(Ebara Corporation, Japan)

P1.11 The effect of surface charge using amino acid and cationic surfactant for high material removal rate (MRR)	236
H. Sun, Y.-C. Kim, I.-K. Park, J.-D. Nam (Sungkyunkwan University, Korea)	
P1.12 Development of Novel Cleaning Solution for Post Chemical Mechanical Planarization Silicon Wafer	241
J. Song ¹ N. Han ² , K. Park ² , S. Yi ² , T. Kim ¹	
¹ (Sungkyunkwan University, Korea); ² (LTCAM Co., Ltd., Korea)	
P1.13 Innovative CMP Solution for Advanced STI Process	245
J. G. Pan ¹ , S. Hung ² , Q. F. Zhang ¹ , C. Lu ² , Y. Cao ¹ , B. Qian ³ , D. Chu ² , E. Su ² , W. Yang ¹	
¹ (United Semiconductor Xiamen, Taiwan); ² (Dow Electronic Materials, Taiwan);	
³ (Dow Electronic Materials, USA)	
P1.14 Pad Conditioning for Poromeric Materials	251
A. Lawing (Kinik North America & Kinik Company, USA)	
P1.15 Development of Advanced CMP Process for the Minimization of Hydrophobic Interaction based on the Surface Treatment Technology	257
H.-M. Kim, J.-H. Heo, J.-E. Kang, S.-H. Park, J.-H. Park, I.-Y. Yoon, B.-U. Yoon, S.-W. Nam (Semiconductor R&D Center, Korea)	
P1.16 Effects of slurry abrasives on dry film CMP	261
M. Yuh ¹ , S. Jang ¹ , H. Kim ² , H. Jeong ¹	
¹ (Pusan National University, Korea); ² (Korea Institute of Industrial Technology, Korea)	
P1.17 W CMP Tiny Particle Reduction Solution	262
K. Li ¹ , T. Wang ¹ , S. Zheng ² , X. Lu ¹	
¹ (Tsinghua University, P.R. China), ² (Hwatsing Technology, P.R. China)	
P1.18 Control of Residual SiN Defects during Cap SiN CMP in Advanced Logic Device Development	266
J. Han (Globalfoundries, USA)	
P1.19 The Numerical Investigation of the Effect of Withdrawing Velocity on Marangoni Drying Performance in the Post CMP Cleaning	267
C. Li, D. Zhao, X. Lu (Tsinghua University, P.R. China)	
P1.20 New Improvement for 200 mm legacy CMP tools for in-situ control of polish uniformity to enable production worthy thick Cu CMP	273
A. Karagoz, P. Ong (IMEC, Belgium); A. Cockburn (Applied Material Europe, Leuven, Belgium), J. Leighton (Applied Materials USA, USA)	
P1.21 Exploring Non-Covalent Interactions at the Slurry/Filtration Media Interface Relevant to CMP Filtration Applications	274
C. Saucedo ¹ , M. Salinas ¹ , K. Wortman-Otto ¹ , H. Khan ¹ , J. J. Keleher ¹ , S. Harton ² , Y. Hudino ² , X. Liu ² , P. T. Connor ²	
¹ (Lewis University, USA); ² (Pall Corporation, USA)	

P1.22 Investigations of Annealing Effect on TSV CMP	275
C. Rao, T. Wang, J. Cheng, Y. Liu, X. Lu (Tsinghua University, P.R. China)	
P1.23 CMP Process for (110)-Germanium roughness reduction	279
M. Lisker, A. Krüger, G. Lupina, Y. Yamamoto, A. Mai (IHP, Germany)	
P1.24 Cu Barrier Metal Slurry for Reducing Defect-Level and Enhancing Removal Performances	285
S. Hong ¹ , J. Lim ² , H. Kang ² , G. Jin ¹ , B. Kim ¹ , S. Lee ³ , Y. Kim ¹ ¹ (SKC Co., Ltd., South Korea); ² (SKhynix, South Korea); ³ (Youngchang Chemical, South Korea)	
P1.25 Observation of the real contact area between PVA brush and surface using polarization plate and evanescent field	288
M. Hanai, T. Sanada (Shizuoka University, Japan); A. Fukunaga, H. Hiyama (Ebara Corporation, Japan)	
P1.26 Highly Efficient Cleaning Formulations for Removing Ceria Slurry Residues in Post-CMP Applications	292
P. Bernatis, J.-F. Lin, P.-Y. Tai, Y.-H. Lin, C.-H. Bai, Y.-H. Tseng, A. Kuroda, C. Yen (DuPont EKC Technology, Taiwan)	
P1.27 CMP Process for Wafer Backside Planarization	296
A. Krüger, M. Lisker, A. Trusch, A. Mai (IHP, Germany)	
P1.28 Optimization of Cu Corrosion Inhibitor Concentration to Reduce Organic Defects	301
B.-J. Cho ¹ , H.-J. Pyun ¹ , S. Shima ² , S. Hamada ² , H. Hiyama ² , J.-G. Park ¹ ¹ (Hanyang University, Korea); ² (Ebara Corporation, Japan)	
P1.29 Dummy Gate Amorphous Silicon CMP Using In-situ Profile CLC Endpoint System for Advanced FinFET	307
D. Tsvetanova ¹ , T. Iizumi ² , B. Ito ² , G. Royere ³ , F. Durix ³ , K. Devriendt ¹ , P. Ong ¹ , H. Struyf ¹ ¹ (IMEC, Belgium); ² (EBARA Corporation, Japan); ³ (EBARA Precision Machinery Europe GmbH, Germany)	

Poster Session 2

- P2.1 Enhancement of reaction rate of Cu film by electrolyte shot 312**
D. Lee, J. Lee, S. Jeong, I. Park, H. Jeong (Pusan National University, Korea)
- P2.2 Corrosion Inhibition of Cobalt During Post-Chemical Mechanical Planarization Cleaning 313**
T. Shibata, T. Kusano, K. Harada, K. Takeshita, Y. Kawase (Mitsubishi Chemical Corporation, Japan)
- P2.3 Influence of different polishing parameters on sapphire substrate CMP 317**
X. Niu, X. Zhao, D. Yin, J. Wang, C. Wang (Hebei University of Technology, P.R. China)
- P2.4 Effect of Flow Rate and Concentration on Filtration Efficiency of Colloidal Abrasives 323**
M. Wu, J. Lee, H. Wang, S. Hsiao, B. Shie, (Entegris Ltd., Taiwan), H. J. Yang (Entegris Korea Ltd., Korea)
- P2.5 Preparation of Ordered Mesoporous SiO₂/Mc Nanocomposite Abrasives and their Chemical Polishing Behavior on Fused Silicon Substrates 329**
X. Li, Z. Chunli, Z. Xin, K. Chengxi, L. Guihai, P. Guoshun (Tsinghua University, P.R. China)
- P2.6 Study of real time chamber monitoring for the contamination factor on the Post CMP Clean progress 334**
S. Shin¹, J. Jang², C. Shin¹, T. Kim¹
¹(Sungkyunkwan University, Korea); ²(Samsung Electronics, Korea)
- P2.7 Evaluation of Polyurethane Pads Properties for Effective Use in Planarization Process 335**
H. J. Chung, C. Shin, Y. Jin, T. Kim (Sungkyunkwan University, Korea)
- P2.8 Carbon Compound Particle Residue Defect Remove by CMP Post Clean 338**
S.-H. Chen, S.-C. Yen, M.-H. Chen, M.-H. Chen, C.-W. Liu (Powerchip Technology Corporation, Taiwan)
- P2.9 Effect of colloidal silica particles on subsurface damage of fused silica optics during CMP process 342**
Z. Chunli, X. Li, K. Chengxi, Z. Xin, P. Guoshun (Tsinghua University, P.R. China)
- P2.10 Prediction of CMP Performance with Slurry Flow Analysis on the Pad Surface .. 346**
S. Hong, Y. Cho, J. Kim, Y. Jin, T. Kim (Sungkyunkwan University, Korea)
- P2.11 The Effect of Chelating Agent in TMAH Based Post Cu-CMP Cleaning Solution . 347**
S. S. Jeon¹, S. Jeon², A. Lim², S. Yi², T. Kim¹
¹(Sungkyunkwan University, Korea); ²(LTCAM, Korea)

P2.12 Effect of Al₂O₃ and SiO₂ Abrasives on the CMP of Molybdenum using Different Polishing Parameters	350
P. Kalantzis ^{1,2} , L. Teugels ² , S. De Gendt ¹	
¹ (Katholieke Universiteit Leuven, Belgium); ² (IMEC, Belgium)	
P2.13 Development of Modularized Electrode in Electro-Kinetic Force Assisted Chemical Mechanical Planarization for Through-Silicon-Via Wafer Planarization	356
A. Chen, M.-Y. Xue, Y.-M. Lin, W.-C. W. Pu (National Taiwan University of Science and Technology, Taiwan)	
P2.14 In-line Real-time Conductivity Technique for Monitoring of Liquid Chemical Concentration during Semiconductor Manufacturing	363
H. Jie, A. Kulkarni, H.-U. Kim, T. Kim (Sungkyunkwan University, Korea)	
P2.15 A Study of Cu inhibitor removal by alkaline agent in post CMP cleaning process .	367
B. Gao, B. Tan, Y. Liu (Hebei University of Technology, P.R. China)	
P2.16 Proposal of Spraying Pure Water Method under the Electric Field and its Behavior Observation in Cleaning Process of CMP	372
M. Fujimoto, M. Uneda (Kanazawa Institute of Technology, Japan)	
P2.17 Research on Multi-Method Endpoint Detection in Chemical Mechanical Planarization Process	377
H. Li, X. Lu, J. Luo (Tsinghua University, P.R. China)	
P2.18 Study on Defect Control of CMP Process Caused by Deposition Process	382
S. Lee ^{1,2} , S. S. Shin ² , T. Kim ¹	
¹ (Sungkyunkwan University, Korea); ² (Samsung Company, Korea)	
P2.19 Galvanic Corrosion Inhibitors for Cu/Ru Couple during Chemical Mechanical Polishing of Ru	383
J. Cheng, T. Wang, C. Rao, X. Lu (Tsinghua University, P.R. China)	
P2.20 The effect of Non-TMAH post-CMP cleaning chemical on Cu CMP	384
J. Im, M. Kang, H. Kim, P. Lim, J. Choi (SK hynix, Korea)	
P2.21 Improvement of Ruthenium Polishing Rate by Addition of Guanidinium Ions	385
C. Wang, Y. Du, J. Zhou, Y. Liu (Hebei University of Technology, P.R. China)	
P2.22 Optimization of WC-Co Composition for CVD Diamond Pad Conditioner	391
M.-J. Kim ¹ , H.-Y. Ryu ¹ , J.-H. Lee ¹ , J.-W. Kim ² , S. Cho ² , D. Hyun ² , H.-G. Jee ² , J.-G. Park ¹	
¹ (Hanyang University ERICA, Korea); ² (SAESOL Diamond Ind, Korea)	
P2.23 Torque measurements generated by a rotating PVA brush without skin layer	396
M. Ito, T. Sanada (Shizuoka University, Japan); A. Fukunaga, H. Hiyama (Ebara Corporation, Japan)	

P2.24 Effect of Mixed Abrasive Slurry during Tungsten CMP Process	400
K. Lee ¹ , J. Seo ¹ , J. Moon ^{1,2} , K. Kim ¹ , M. Lee ¹ , K. You ¹	
¹ (Hanyang University, Korea); ² (Samsung Electronics. Co., Ltd., Korea)	
P2.25 Chemical Mechanical Polishing of SiC Substrate Using Enhanced Slurry of Nano-Bubbles with Active Gas by Plasma	401
S. Mizuuchi ¹ , M. Uneda ¹ , K. Shibuya ² , Y. Nakamura ² , D. Ichikawa ² , K.-I. Ishikawa ¹	
¹ (Kanazawa Institute of Technology, Japan); ² (Fujikoshi Machinery Corp., Japan)	
P2.26 Improvement of Wafer Edge Profile by Controlling a Pad Profile	406
S. Kim, T. Kim (Sungkyunkwan University, Korea); S. Kim (Samsung Electronics Co., Korea)	
P2.27 Effect of Corrosion Inhibitor and Non-ionic Surfactant on CMP of Cu/Co Barrier Stack	407
L. Jiang ¹ , Y. He ² , L. Qian ¹	
¹ (Southwest Jiaotong University, P.R. China); ² (Tsinghua University, P.R. China)	
P2.28 Minimize Tungsten Plug/Vias Recess By Co-Inhibitor System PCMP W Cleaner .	412
K. Chao, M. Tsai, J. Chen, C.Yen (EKC Technology, DuPont Electronics and Communications, Taiwan)	
P2.29 Study on the Grit Angle of Single Diamond Dressing on CMP Pads	413
A. Chen ¹ , Y. Ting ¹ , T.-H. Li ¹ , H. Hiyama ² , Y. Wada ² , P.-J. R. Shiu ² , K. Kimura ³	
¹ (National Taiwan University of Science and Technology, Taiwan);	
² (Ebara Corporation, Japan); ³ (Nano Art Project, Japan)	
P2.30 Study of heterogeneous Fenton-like reaction for tungsten chemical mechanical planarization via CuO immobilized silica nanoparticles	419
K. Kim, K. Lee, J. Moon, J. Seo, U. Paik (Hanyang University, Seoul, South Korea)	