

TABLE OF CONTENTS

Preface	iii
ADVANCES IN WET CLEANING	1
SINGLE-WAFER SPIN CLEANING WITH REPETITIVE USE OF OZONIZED WATER AND DILUTED HF ("SCROD") T. Osaka, A. Okamoto, H. Kuniyasu, and T. Hattori (Invited)	3
EVALUATION OF NEW MEGASONIC SYSTEM FOR SINGLE WAFER CLEANING K. Takeuchi, A. Tomozawa, A. Onishi, A. Tanzawa, T. Azuma, S.-I. Umemura, Y. Wu, M. Bran, and B. Fraser	15
ADVANCED SINGLE CHEMISTRY ALKALINE CLEANING IN A SINGLE TANK TOOL B. Onsia, E. Schellkes, R. Vos, S. De Gendt, O. Doll, A. Fester, B. Kolbesen, M. Hoffman, Z. Hatcher, K. Wolke, P. Mertens, and M. Heyns	23
NEW SHORT CYCLE WET CLEANING CONCEPT FOR 300 mm FABRICATION LINE S. Verhaverbeke and K. Truman	31
ORGANICS	37
IMPACT OF ORGANIC CONTAMINATION ON DEVICE PERFORMANCE D. Riley, J. Guan, G. Gale, G. Bersuker, J. Bennett, P. Lysaght, and B. Nguyen	39
INFLUENCE OF MOLECULAR WEIGHT OF ORGANIC CONTAMINANTS UPON ADSORPTION BEHAVIORS ONTO SILICON SURFACES M. Nagase, M. Kitano, Y. Wakayama, Y. Shirai, and T. Ohmi	47
THE REMOVAL OF ORGANIC CONTAMINATION BY O ₃ /DI-WATER PROCESSES: A THEORETICAL STUDY F. De Smedt, H. Vankerckhoven, C. Vinckier S. De Gendt, M. Claes, and M. Heyns.	54

REMOVAL OF LIGHT AND HEAVY ORGANICS BY OZONE PROCESSES A. Sehgal and M. R. Yalamanchili	61
EFFECT OF pH VALUES IN OZONIZED ULTRAPURE WATER ON CLEANING EFFICIENCY I. Yokoi, G.-M. Choi, and T. Ohmi	69
REMOVAL OF PHOTORESIST BY O ₃ DI-WATER PROCESSES: DETERMINATION OF DEGRADATION PRODUCTS H. Vankerckhoven, F. De Smedt, C. Vinckier, B. Van Herp, M. Claes, S. De Gendt, and M. Heyns	77
METALS	85
ENGINEERING TOOLS FOR DESIGNING A METALLIC REMOVAL SOLUTION S. Verhaverbeke (Invited)	87
REDUCTION OF SURFACE METALLIC CONTAMINATION THROUGH OPTIMIZED RINSING AND SINGLE-WAFER DRYING W. Fyen, F. Holsteyns, J. Lauerhaas, T. Beard, P. Mertens, and M. Heyns	91
DIFFERENT ADSORPTION BEHAVIORS OF PLATINUM GROUP METALS ON SILICON SURFACES I. Yokoi, K. Kitami, G.-M. Choi, and T. Ohmi	102
CO-DEPOSITION MECHANISM OF TRACE Cu AND Fe ON H-Si (100) SURFACE IN BUFFERED FLUORIDE SOLUTIONS T. Homma, T. Kono, T. Osaka, M. Chemla, and V. Bertagna	110
A STUDY OF METALLIC CONTAMINATION REMOVAL AND ADDITION USING MODIFIED SC-1 SOLUTIONS C. Beaudry, H. Morinaga, and S. Verhaverbeke	118
MICRO-CONTAMINATION OF COPPER AND SILVER ON SILICON WAFER SURFACES X. Cheng, C. Gu, and Z.-D. Feng	126
IONIC CONTAMINATION OF THE SILICON WAFER FROM WAFER CLEANING PROCESS H. O. Omorogie, S. J. Buffat, and D. Sinha	135

PARTICLES	145
SUB 100nm PARTICLE REMOVAL WITH DEIONIZED WATER AND A MEGASONIC FREQUENCY OF 835kHz J. Lauerhaas, Y. Wu, K. Xu, G. Vereecke, R. Vos, K. Kenis, P. Mertens, T. Nicolosi, and M. Heyns	147
EFFECT OF H ₂ O ₂ AND IPA ADDITION IN DILUTE HF SOLUTION ON SURFACE ETCHING AND PARTICLE REMOVAL EFFICIENCY D.-H. Eom, S.-H. Lee, K.-S. Kim, C.-H. Lee, and J.-G. Park	156
ACTIVITY OF HF SOLUTIONS AND PARTICLE REMOVAL USING HF SOLUTIONS S. Nelson, J. Sabol, and K. Christenson	164
EFFECT OF WAFER BACKSIDE ON PARTICLE ADDITION BEHAVIOUR OF HF-RCA SEQUENCE M. Strada, D. Lodi, E. Bellandi, and M. Alessandri	172
NEW APPROACH FOR STUDY OF PARTICLE ADHESION AND REMOVAL RELEVANT TO POST CMP CLEANING S.-Y. Lee, S.-H. Lee, D.-H. Eom, K.-S. Kim, H.-S. Song, and J.-G. Park	180
OPTIMIZATION OF A BRUSH SCRUBBER FOR NANO-SIZED PARTICLES K. Xu, R. Vos, S. Arnauts, M. Lux, W. Schaetzlein, U. Speh, P. Mertens, M. Heyns, and C. Vinckier	187
NATIVE OXIDE	195
INFLUENCE OF AMBIENT OXYGEN AND MOISTURE ON THE GROWTH OF NATIVE OXIDE ON SILICON SURFACES IN MINI-ENVIRONMENTS K. Saga, H. Kuniyasu, and T. Hattori	197
SPECTROSCOPIC AND ELECTROCHEMICAL STUDIES OF THE GROWTH OF CHEMICAL OXIDE IN SC1 AND SC2 S. Petitdidier, F. Guyader, K. Barla, D. Rouchon, N. Rochat, R. Erre, and V. Bertagna	205
ELECTROCHEMICAL STUDY OF ULTRA-THIN SILICON OXIDES V. Bertagna, R. Erre, S. Petitdidier, D. Levy, and M. Chemla	211

DRY CLEANING	219
A SURFACE CHEMISTRY APPROACH TO THE DEVELOPMENT OF GAS-PHASE WAFER CLEANING PROCESSES	
A. J. Muscat, A. Thorsness, G. Montano-Miranda, and C. Finstad (Invited)	221
VACCUM CLUSTERED DRY CLEANING FOR PRE-GATE SURFACE PREPARATION	
B. Schwab, R. Gifford, and J. Butterbaugh	233
GAS-PHASE SURFACE CONDITIONING IN A HIGH-k GATE CLUSTER	
P. Roman, D.-O. Lee, J. Wang, C.-T. Wu, V. Subramanian, M. Brubaker, P. Mumbauer, R. Grant and J. Ruzylo	241
ETCHING OF SILICON NATIVE OXIDE USING ULTR-SLOW MULTICHARGED Ar ^{q+} IONS	
V. Le Roux, G. Machicoane, G. Borsoni, M. Korwin-Pawlowski, N. Bechu, S. Kerdiles, R. Laffitte, L. Vallier, P. Roman, C.-T. Wu and J. Ruzylo	249
CRYOKINETIC CLEANING ON Cu/LOW-k DUAL DAMASCENE STRUCTURES	
B. Kirkpatrick, E. Williams, S. Lavangkul, and J. Butterbaugh	258
BACK-END CLEANS	267
SURFACE PREPARATION CHALLENGES WITH Cu/Low-k DAMASCENE STRUCTURES	
B.K. Kirkpatrick (Invited)	269
POST ETCH/ASH CLEANING OF DUAL DAMASCENE STRUCTURES: SINGLE WAFER MEGASONICS WITH STG DRY	
Y. Fan, Y. Wu, and B. Fraser	281
IMPROVED POST-ETCH VIA CLEAN WITH FLUORIDE BASED SEMI-AQUEOUS CHEMISTRY USING INTERMEDIATE RINSE	
J. Diedrick, M. Fussy, S.R. Small, and W. Robertson	287
CORROSIVE BEHAVIOR OF TUNGSTEN IN POST-ETCH RESIDUE REMOVER	
H. Zhang, B.H. Chen, J.H. Ye, S.Y.M. Chooi, R. Cha, and L. Cha	295

EMERGING TECHNOLOGIES	303
EFFECTS OF SUPERCRITICAL CO ₂ ON THE ELECTRICAL CHARACTERISTICS OF SEMICONDUCTOR DEVICES C. O'Murchu, A. Mathewson , and E. Francais	305
OZONATED HF APPLICATIONS IN A SPRAY PROCESSING M. Claes, E. Rohr, S. De Gendt, S. Lagrange, E. Bergman, and M. Heyns	314
THE EFFECT OF SURFACTANTS IN DILUTE HF SOLUTIONS M. Leahman, M.Simmons, M. Jackson, C. Spivey, B. Hong, and E. J. Mori	322
IMPROVEMENT OF SC-1 BATH STABILITY BY COMPLEXING AGENTS H. Saloniemi, T. Visti, S. Eranen, . Kiviranta, and O. Anttila	329
PREVENTION OF Si ETCHING IN DILUTED SC1 SOLUTIONS E. Bellandi, M. Alessandri, D. Lodi, M. Strada, S. Pipia, S. Petitdidier, and D. Levy	337
<i>In Situ</i> PRE-EPI CLEAN PROCESS FOR NEXT GENERATION DEVICES I. Kashkoush, G. Chen, R. Ciari, and R. Novak	345
ADVANCED PRE-GATES FOR HIGH QUALITY THIN OXIDES AND NITRIDED OXIDES E. Baiya, J. Rosato, D. Acock, and J. Smythe	352
EFFECT OF COMPOSITION AND POST-DEPOSITION ANNEALING ON THE ETCH RATE OF HAFNIUM AND ZIRCONIUM SILICATES IN DILUTE HF J.J. Chambers, A.L. Rotondaro, M.J. Bevan, M.R. Visokay, and L. Colombo	359
AUTHOR INDEX	367
SUBJECT INDEX	371