Table of Contents

Preface, Sponsors and Organizing Committee

Chapter 1: Grinding and Grinding Wheels

Wheel	
Y.B. Wu, L. Jiao, H.R. Guo, M. Fujimoto and K. Shimada	3
Study on the High-Efficiency Smoothness Grinding of Soft Magnetic Powder Cores T. Ueno, T. Ishimine, K. Matsunuma, T. Nishioka, Y. Mochida and Y. Shimada	10
Grinding Performance Using Alkaline Electrolyzed and High-Frequency Reduced Water S. Iba, K. Ohashi, K. Honiden, I. Kitajima and S. Tsukamoto	16
Study on Grinding Processing of Sapphire Wafer Y. Ebina, W. Hang, L.B. Zhou, J. Shimizu, T. Onuki, H. Ojima and Y. Tashiro	22
Effect of the Grain Depth of Cut on Cross Sectional Profile - Theoretical Analysis of Ground Surface Roughness	
N. Yoshihara, H. Murakami, N. Nishikawa, M. Mizuno and T. Iyama	28
Development of a Vitrified Bonded Superabrasive Wheel with Electrical Conductivity and its Application	2.4
M. Iwai, Y. Kazui, S. Ninomiya and K. Suzuki	34
Fundamental Study on Setting of Diamond Abrasive Grains Using Electrostatic Force for Single-Layered Metal Bond Wheel K. Ohashi, Y. Kawasuji, Y. Shinji, Y. Samejima, S. Ogawa and S. Tsukamoto	40
Porous Composite-Bonded CBN Grinding Wheel with Alumina Bubbles	40
Z.Z. Chen, W.F. Ding, J.H. Xu, C.J. Song, Y.C. Fu and C.Y. Yang	46
Estimation of the Grinding Time by Means of the Grinding Process Model T. Yamada, H.S. Lee and K. Miura	52
Study on the Simulation of Grinding Burn T.B. Yu, C. Li, D.X. Zhang and W.S. Wang	58
Experimental Research on the Abrasive Belt Grinding Titanium Alloy Blade of Aviation Engine H. Chai, Y. Huang, Y. Zhao and X.D. Zhang	64
Testing of a CNC Control Abrasive Belt Grinding Machine Based on Ultrasonic Thick Measure for Nuclear Zirconium Alloy Y. Huang, C.Y. Tang, M.X. Zhang, Y.J. Wang and Y.S. Chen	70
Research on the Key Technology of NC Abrasive Belt Grinding for the Leading and Trailing Edges of Aeroengine Blades	
Y. Huang, X.X. Ye, M.D. Zhang and H.W. Fang	76
Optimal Design of the Grinding Parameter on Zr-4 Cladding Tubes Abrasive Belt Grinding Based on BP and GA	
Y. Yang, Y. Huang, M.X. Zhang and H.P. Wei	82
Experimental Investigation on Grinding Surface Condition of 9Mn2V under Different Tempering Processes M. Chen, D.P. Dong, G.G. Guo and Q.L. An	88
Grinding Force in Creep Feed Grinding of Titanium Alloy with Monolayer Brazed CBN	00
Wheels C.Y. Yang, J.H. Xu and W.F. Ding	94
Accurate Extraction of Normal Residual Error for Compensation Grinding F.J. Chen, S.H. Yin and J.W. Yu	100
Grinding Performance Evaluation of the Developed Chemo-Mechanical Grinding (CMG) Tools for Sapphire Substrate Z.G. Dong, S. Gao, P. Zhou, R.K. Kang and D.M. Guo	105
A Grinding Protocol for the Fabrication of Micro/Meso Aspheric Moulds for Optic	103
Applications H. Huang	111

Industrial Application of the MCG (Minimum Coolant Grinding) Technology I. Pombo, J.A. Sánchez, E. García, N. Ortega, B. Izquierdo and S. Plaza	117
The Characteristics of High-Speed Cylindrical Grinding of Silicon Carbide and its Influence on the Surface Layer	122
J.M. Ni, B.Z. Li and J.Z. Pang An Experimental Investigation of Ultrasonic Assisted Grinding in DOE Approach	123
K.T. Kim, Y.H. Hong, K.H. Park, Y.J. Choi, S.W. Lee and H.J. Choi	129
Design of Ultrasonic Horn for Grinding Using Finite Element Method Y.J. Choi, K.H. Park, Y.H. Hong, K.T. Kim, S.W. Lee and H.J. Choi	135
Experimental Investigation on Ultrasonic Assisted Grinding of High Volume Fraction SiC Particles Reinforced Al Matrix Composites Z.G. Dong, F.J. Ma, R.K. Kang and K. Su	142
Effects of Ultrasonic Frequencies on Grinding Force of Nano-Composite Ceramics Based on Nonlocal Theory	1.40
B. Zhao, P.Y. Bian and Y. Li Experimental Research on Surface Roughness of Ultrasonic Assisted Grinding in Face	148
Grinding Process F.H. Zhang, L.F. Liu and C.H. Li	154
Experimental Research on Dry Grinding of Titanium Alloy with Graphite Coated Brazed cBN Mounted Wheel	
J. Wu, Y. Chen, Y.C. Fu, L.Y. Ding and K. Chen	160
Research on Functional Surface Grinding of Medical Titanium Plate W.S. Wang, B.G. Zhang, H.F. Zhao, W. Wang and H. Li	165
Thermal Characteristics Analysis of Liquid Hybrid Bearing on Ultra-High Speed Grinding X.Z. Wang, T.B. Yu, Y.H. Song and W.S. Wang	171
Three Dimensional Analysis of a Grinding Wheel Surface with Image Processing A. Sakaguchi, T. Kawashita and S. Matsuo	177
Genetic Programming for Grinding Surface Roughness Modelling X. Chen and A. Alabed	183
Research Progress of On-Line Measurement and Compensation Technology about Grinding Wheel Wear W. Liu, Z.H. Deng, L.L. Wan and H. Tang	190
Influence of the Metallurgical Transformation Induced by Grinding on the Residual	190
Stresses Computation S. Youssef, H. Sallem, A. Brosse and H. Hamdi	196
Chapter 2: Truing and Dressing of Grinding Wheels	
Performance of Newly Developed Single-Point Diamond Dresser in Terms of Cutting-Point Rake Angle	205
Y. Mochida, A. Kubo, J. Tamaki, K. Harano, H. Sumiya and A.M.M.S. Ullah Thermo-Chemical Dressing of Coarse Grained Diamond Grinding Wheels	205
O. Riemer and Y. Mutlugünes	211
T-Dress, A Novel Approach in Dressing and Structuring of Grinding Wheels T. Tawakoli and A. Daneshi	217
Visualization of Grinding Wheel Surface Topography for Multiple Passes of Rotary Diamond Dresser	
M.A.K. Chowdhury, J. Tamaki, A. Kubo and A.M.M.S. Ullah	222
Chapter 3: Finishing, Lapping and Polishing	
Preliminary Studies for Precision Polishing of Micro Structured Mold by Using Three- Dimensional Low Frequency Vibration Utilizing Piezoelectric Actuator Incorporated with Mechanical Amplitude Magnified Mechanism S.K. Chee, H. Suzuki, J. Uehara, T. Yano and T. Higuchi	231
Influence of Lapping Parameters on 6H-SiC Crystal Substrate (0001) C Surface Based on	
Diamond Particle J.X. Su, X.L. Liu, Z.Q. Zhang and Z.X. Liu	237

Influence of Polishing and Pressing Force on the Material Removal Rate in Fixed Abrasive Polishing with Compact Robot M. Niwa, S. Ogawa, T. Hirogaki, E. Aoyama and Y. Onchi	243
Surface Roughness as a Function of Work Done by Tangential Force in Magneto-	213
Rheological Finishing C.W. Kum, T. Sato and S. Wan	249
Ultrasonic Vibration Assisted Mechanical Chemical Polishing (MCP) of Silicon Carbide Y.S. Liao, Y.P. Yu and C.W. Huang	255
The Key Technologies and Advances of Ultra-Precision Single-Plane Polishing and Lapping Devices	
Q.J. Li, C.Y. Wang, L.J. Zheng, Y.J. Wang and Y.X. Song	261
Parameters Optimization on the Lapping Process with Porous Self-Generation Superabrasive Tool by Applying Taguchi Method B.H. Lv, Z. Wu, J.L. Yuan, Q.F. Deng and P. Zhao	267
Experimental Study on Polishing Properties of Silicone Oil Based Magnetic Compound Fluid S.H. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and I.W. Vin, Z.V. Chang, Z.O. Vin, E.I. Chan, and Z.O. Vin, E.I.	273
S.H. Yin, Z.Y. Cheng, Z.Q. Xu, F.J. Chen and J.W. Yu Vibratory Finishing of Immobilized Cylinders	213
S. Wan, T. Sato and A. Hartawan	278
A Framework for the Analysis of Mass Finishing Processes S. Wan	284
Simulation of 1D Abrasive Vibratory Finishing Process P.P. Kumar and S. Sathyan	290
A Study on the Characteristics of a Wafer Final Polishing Process at Various Machining	
and Temperature Variation S.H. Kim, S.G. Lee, S.G. Choi, W.K. Choi, E.S. Lee, C.H. Lee and H.J. Choi	296
Effect of Fabrication Conditions on Ultra-Fine Abrasive Polishing Pad Y.H. Zhang, J. Lu, H. Huang and X.P. Xu	302
A New Automatic Backlash Adjustment Method for Lapping of Spiral Bevel Gear J.W. Yu, Y.J. Deng, W.Y. Zou and G.F. Zhang	307
Kinematics Simulation of Eccentric Dual Rotated-Plates Lapping for Bearing Balls W.F. Yao, J.L. Yuan, B.H. Lv and Q.F. Deng	312
Research on the Workpiece Kinematics in Face Lapping with Friction Drive U. Heisel and P. Jakob	318
Slurry Flow Visualisation of Chemical Mechanical Polishing Based on a Computational Fluid Dynamics Model	
Y.B. Tian, S.T. Lai and Z.W. Zhong Simulation of CMP Process Based on Mixed Elastohydrodynamic Lubrication Model with	324
Layered Elastic Theory	220
P. Zhou, R.K. Kang, Z.J. Jin and D.M. Guo	330
Chapter 4: Abrasive Jet Machining	
An Experimental Study of the Abrasive Water Jet Micro-Machining Process for Quartz	
Crystals H. Qi, J.M. Fan and J. Wang	339
A 3D Simulation on Fluid Field at the Impact Zone of Abrasive Water Jet under Different Impact Angles	
Z. Lv, C.Z. Huang, J. Wang, H.T. Zhu and C.L. Che	345
The Effect of Abrasive Water Jet Process Variables on Surface and Subsurface Condition of Inconel 718	
G.A. Escobar-Palafox, R.S. Gault and K. Ridgway	351
Chapter 5: Advances in Machining Technologies	
Effect of Ground Surface Roughness of Ball End Mill on Cutting Characteristics M. Furuno, K. Kitajima and T. Akamatsu	359

Press Cutting Characteristics of Plastic Pipe by Using Knife Edge Tool E. Nakanishi, S. Maki and M. Aoki	365
Effect of MnS on the Cutting Mechanism of Powder Metallurgy Steel in Cutting Speeds Ranging from 1 m/s to 150 m/s	200
J. Shinozuka, H. Yachi, T. Higashi, M. Sando, T. Maetani, S. Unami and Y. Ozaki	370
A Study of Deep-Hole Machining of Stainless Steel with Small-Diameter Drill Y. Masuta, K. Okuda, H. Shizuka and M. Nunobiki	376
Finish Cutting of Carbide Mold with Thermally Affected Layer by Diamond Tool K. Imazato, K. Okuda, H. Shizuka and M. Nunobiki	382
The Effects of Resharpening Accuracy on Drill Failure and Hole Straightness in High Aspect Ratio Gundrilling of Inconel-718 K.S. Woon, S. Kanno and K. Liu	388
Effects of Ultrasonic Vibrations Given to an Electrode on the EDM Performance in Processing PCD	
K. Suzuki, T. Takada, Z.R. Zhou, T. Okamichi, M. Iwai and S. Ninomiya	394
Surface Finishing of Electrically Conductive Diamond Tools by Electrolytic Machining M. Iwai and K. Suzuki	400
Proposal of Purification Method of Grinding Coolant by Dissolution of Micro-Bubbles H. Sakamoto, H. Tsubakiyama and M. Takeishi	406
Filter-Less Purification of a Water-Soluble Coolant by Using PGA Based Flocculants and Microbubbles	
S. Ninomiya, K. Komuro, M. Iwai and K. Suzuki	412
Slicing Brittle Material with Active Braze Coating Diamond Wire P.L. Tso, Y.T. Chen and W.L. Pai	419
Improving Tool Wear Resistance in Steel Cutting by Textured Surface and its Mechanism T. Sugihara, T. Enomoto and S. Yukinaga	424
Micro-Structuring on Cylindrical Inner Surface Using Whirling Electrical Discharge Texturing	
V. Lertphokanont, T. Sato, M. Ota, K. Yamaguchi and K. Egashira	430
Study on the Combined Machining Technology of Sawing and Grinding for Drilling Aramid/Epoxy Composites	126
H. Gao, Y. Zhuang, B. Wang and J.L. Huang Investigation of Micro-Drilling for Printed Circuit Boards Containing High-Hardness	436
Fillers T. Funabiki, T. Hirogaki, E. Aoyama, K. Ogawa and H. Kodama	442
Modeling the Property Variation of Diamond Composite and its Impact on the Reliability of	2
Cutting Tools Y. Sun and X.S. Li	448
Cutting Forces and Tool Wear in Dry Milling of Ti6Al4V	454
Y. Chen, H.Z. Li and J. Wang Development of Al ₂ O ₃ /TiCN Ceramic Composite Cutting Tool and Research on its Milling	454
Performance	4.60
P. Zou, X.L. Yang, C.Y. Li, W.Y. Tian and L.J. Chen Ball-End Milling of Cr12MoV Die Steel Using Ceramic Tool and Cements Carbide Tool	460
B. Zou, C.Z. Huang, Z.Y. Liu, X.Q. Zhuang and J. Wang	466
An End-Milling Condition Decision Support System Using Data-Mining for Difficult-to-Cut Materials	470
H. Kodama, M. Shindou, T. Hirogaki, E. Aoyama and K. Ogawa Research on the Drilling Temperature Field Model of the Unidirectional Carbon Fiber	472
Epoxy Composites G.P. Zhu, Y.J. Bao and H. Gao	478
Chip Formation Characteristics in High-Speed Machining of Hardened AISI1045 Steel B. Wang, Z.Q. Liu and Q.B. Yang	484
Mechanical Behavior of Single Crystal Copper for Different Shearing Directions S. Kano and A. Korenaga	490
Machinability Study on Hard Milling of Ultra-High Strength Steel 30Cr3SiNiMoVA	
M. Chen, J. Xu, Z.Q. Liu and Q.L. An Review of Microelectrode Fabrication	496
P.C. Liu, J. Zhou, S.L. Li and H.M. Ma	503

Surface Quality Improvement in Meso-Scale Milling with Spindle Axial Directional Ultrasonic Vibration Assistance J.H. Ko, K.C. Shaw, S.W. Tan and R.M. Lin	508
Chapter 6: Micro/Nano-Fabrication	
Basic Study on Micro V-Groove Cutting of Tungsten Carbide Using Diamond Tools T. Kitajima, S. Okuyama and A. Yui	517
Study on Fine Groove Milling of Microchannel Dies – Tool Bending in Milling of Micro-Grooves K. Iwatsuka, Y. Isokawa, Y. Maeda, H. Tanaka, T. Yazawa and S. Suzuki	523
Effect of Different Dielectric Fluids on Micro EDM of Low Conductivity Ceramic Material RB-SiC	
P.J. Liew, J.W. Yan, T. Masaki and T. Kuriyagawa	529
A Processing Technical Analysis for the Characteristics of Forces and Surface Roughness in Micro-Scale Milling Y.D. Gong, J.F. Zhang, J. Cheng and Y.Z. Zhang	535
Experimental Study on Cutting Performance in Micro-Grinding Hard Brittle Materials Y.D. Gong, J. Cheng, Z.Z. Wu, C. Wang and J.F. Zhang	541
Atomic-Scale Grooving on Copper: End-Milling vs. Peripheral-Milling D.D. Cui, K. Mylvaganam and L.C. Zhang	546
Micro Milling for Polymer Materials Used in Prototyping of Microfluidic Chip Application A. Ampara, K.C.S. Shaw and K. Liu	552
An Experimental Study of the Effect of Cutting Parameters on Micro Milling Process B. Wu, H.Z. Li, J. Wang and X.B. Jing	558
Mechanical Properties and Deformation of LiTaO ₃ Single Crystals Characterised by Nanoindentation and Nanoscratch A.S. He, H. Huang and L.B. Zhou	564
Determination of the Minimum Depth of Cut in Nanometric Machining Using Molecular Dynamics Simulation A. Oluwajobi and X. Chen	570
A Non-Dimensional Analysis of Tool Edge Radius Effect on the Mechanics of Micromachining K.S. Woon, M. Rahman and K. Liu	576
Influence of Centrifugal Force on Characteristics of Turbine Shaft for Micro-Spindle for Micro-Cutting	370
W. Li, Z.X. Zhou, X.M. Huang, C. Chen and L.Y. Meng	582
Effect of Machining of Small Tools by Means of Focused Ion Beam K. Miura, S. Satoh, T. Yamada and H.S. Lee	588
Chapter 7: Other Novel Technologies and Advanced Studies	
Application of Cavitation Aided Abrasive Machining to Manufacture of Micro Air Vents on Injection Molds	
N. Lu, K. Ohashi, A. Hirashima, A. Shimizu and S. Tsukamoto	597
Static Properties Research of Grinding Dynamometer for Wafer Grinder J. Zhang, Y. Bai and M. Qian	603
Development of Ultra-Precision Grinder for 300mm Wafers X.L. Zhu, Z.G. Dong, R.K. Kang and D.M. Guo	609
Deposition and Tribological Properties of CVD Diamond/Diamond-Like Carbon Composite Films B. Shen, L. Wang, S.L. Chen and F.H. Sun	615
Thermal Analysis of Multi-Pass Laser Irradiation on Fused Silica P. Yao, C.Z. Huang, J. Wang and T. Kuriyagawa	621
Study on Friction Coefficient between Carbon/Epoxy Composites and a Monocrystalline Diamond under Different Temperatures B. Wang, H. Gao, S.P. Zhang and Y.J. Bao	627

Simulation of Temperature Field Induced in Localized Ultra-High Frequency Induction Brazing of Diamond Tools	
Q.L. Li, J.H. Xu, H.H. Su and Y.C. Fu	633
Study of Acoustic System Characteristics of Ultrasonic Machining Based on Similarity Principle P.Y. Bian, B. Zhao and Z. Liu	639
Thermal-Mechanical Analysis of Hybrid Spindle System Based on FEM W.S. Wang, P. Guan and T.B. Yu	644
Study on Microstructure and Friction of Bimetal 1.5Cr4.8Ni with Cast Iron and Low Carbon Steel Q. Zhang, Z.Y. Jiang, G.L. Xie, D.B. Wei and J.T. Han	650
Research on Digital Filters for Si Wafer Surface Profile Measurement - Design of Filters by Total Variation H. Ojima, K. Nonomura, L.B. Zhou, J. Shimizu and T. Onuki	656
Application of Automatic Ultrasonic Wall Thickness Measurement System in Nuclear Fuel Encrust Tube Billet Wall Abrasive Grinding	
Y. Huang, Y.S. Chen, W. Wan, C.Y. Tang and M.D. Zhang	662