

Table of Contents

Preface

Lessons from 30 Years of Structural Ceramics

R.C. Bradt 1

Nano-Scale Composite Structure of Polymer-Route Si-C-M-O Fibers Characterized by Small-Angle X-Ray Scattering

K. Suzuki, T. Kamiyama and M. Shibuya 13

Preparation and Properties of Silicon Carbide Reticulated Porous Ceramics

D.L. Jiang and X.W. Zhu 19

Science-Based Ceramic Powder Processing

K.G. Ewsuk and J.G. Arguello 27

A New Opportunity for Nanopowder Forming Processes

H. Song, J.S. Kim and H.W. Lee 35

A New Approach to Preparing High-Performance Ceramic Parts with Complex Shapes: Aqueous Colloidal Injection Molding

Y. Huang, L.G. Ma, J.L. Yang and Z.J. Zhang 39

Aqueous Slip-Casting of AlN

M. Takahashi, Y. Kataoka, C.-. Chieh, M. Oya and M. Fuji 45

Nanosized Oxide Powders Fabricated by Mimic Alkoxide Methods and their Sintering

T. Ikegami 51

The Research of Multi-Phase Materials

J.K. Guo, G.J. Li, G.Q. Shao and X.X. Huang 57

Deformation during Sintering in Alumina Ceramic Made using Uniaxial Pressing

A. Shui, S. Tanaka, N. Uchida and K. Uematsu 61

Densification Behavior and Grain Boundary Diffusivity in Cation-Doped Alumina

S. Watanabe, H. Yoshida and T. Sakuma 67

Densification of Ca- α SiAlON Nano Particles by Spark Plasma Sintering

M. Iguchi, J. Tatami, M. Hotta, C. Zhang, K. Komeya, T. Meguro, M. Omori, T. Hirai, M.E. Brito and Y.B. Cheng 71

Fabrication of β -SiAlON Nano-Ceramics and their Properties

Q. Li, K. Komeya, J. Tatami, T. Meguro and L. Gao 75

Non-Equilibrium Processing of Ceramics

Z.J. Shen and M. Nygren 79

Effect of TiO₂ and AlN Additions on the Sintering Behavior of the Si₃N₄-Y₂O₃-Al₂O₃ System

J. Tatami, M. Toyama, K. Noguchi, K. Komeya, T. Meguro and M. Komatsu 83

Effect of Coarser Grains on Sintering of AlN

T. Hoshina, J. Tatami, T. Meguro, K. Komeya, A. Tsuge, A. Kuibira and H. Nakata 87

Densification and Mechanical Properties of 4AlN·SiC Ceramics - Utilization of Nanocomposite Powders Prepared by the Nitridation of Aluminum Silicon Carbide -

K. Itatani, R. Tsukamoto, H. Uchida, M. Aizawa, A.C.A. Delsing, H.T. Hintzen and I. Okada 91

Low-Cost Production of Large RBSC Components by Plastic Forming Processes

H.W. Lee, H.W. Jun, J. Kim, H. Song and J. Ha 95

Synthesis of α -SiAlON from Slag by SHS and its Reaction Behavior

J.X. Jiang, W.W. Chen, P.L. Wang, Y.B. Cheng, H.R. Zhuang and D.S. Yan 101

Fabrication and Evaluation of Reaction-Bonded Aluminum Nitride from Al Powder Compacts Coated with CaCO₃, SrCO₃ and BaCO₃

T. Wakamatsu, J. Tatami, K. Komeya and T. Meguro 105

Synthesis of β -SiAlON Powder by Carbothermal Reduction-Nitridation of Zeolite

F. Li, J. Tatami, T. Meguro and K. Komeya 109

In Situ Reactive Synthesis and Phase Stability Investigation in the AlN-SiC System

W.B. Bu, T. Qiu, J.L. Shi and J. Xu 113

Reaction Synthesis of Ceramic Composites Containing In Situ Formed Boron Nitride as Dispersed Phase

G.J. Zhang, M. Ando, J.F. Yang and T. Ohji 117

Molecular Chemical Concepts for the Synthesis of Novel Ceramics	121
R. Riedel, E. Horvath-Bordon, S. Nahar-Borchert and E. Kroke	
Radiation Curing of Polyvinylsilane as a Precursor for SiC-Based Material	129
A. Idesaki, M. Sugimoto, S. Tanaka, M. Narisawa, K. Okamura and M. Itoh	
Development of Silicon Carbide Micro-Tube from Precursor Polymer by Radiation Oxidation	
M. Sugimoto, A. Idesaki, S. Tanaka and K. Okamura	133
Synthesis and Characterization of Carbon-Base Hybrid Ceramics in Coating Form from Thermosetting Resin – Alkoxide Mixtures	
M. Narisawa, E. Tanaka, R. Nishimura, K. Okamura, M. Itoh and T. Kamiyama	137
Effect of Texture and Structure of Carbon Sources on Synthesis of β-SiC Thin Film	
Y. Uchiyama, N. Urase, T. Higuchi and H. Sano	141
Synthesis of Transition Metal Carbide, Carbonitride and Boride Whiskers	
M. Johnsson, M. Carlsson and M. Nygren	145
First-Principles Calculations of Silicon Nitrides and SiAlONs	
I. Tanaka, K. Tatsumi, F. Oba and H. Adachi	149
Oxynitride Glasses and their Properties – an Overview	
S. Hampshire	155
Study of Silicon Carbide Material Bonded with Oxide	
Q. Wang, Z.H. Jin and Y.L. Wang	161
Effects of SiO_2 and Rare-Earth Oxide Additions on Densification and Mechanical Properties of Silicon Carbide Ceramics	
T. Yano, D.C. Park, Y. Horie, H. Inoue, K. Katayama and T. Iseki	165
Microstructures and Mechanical Properties of Mo_5Si_3 Particle-Reinforced Si_3N_4 Composites	
T. Iizuka and H. Kita	169
Crack-Healing Behavior of $\text{Al}_2\text{O}_3/\text{SiC}$ Composite Ceramics and the Bending Strength of Crack-Healed Body	
K. Ando, B.S. Kim, M.C. Chu, S. Saitou and S. Sato	175
Fabrication and High-Temperature Mechanical Properties of SiC-Reinforced C11_b/C40 Structured MoSi₂ Matrix Composites	
A.D. Shan, H. Hashimoto and Y.H. Park	179
Sintering Behavior and Mechanical Properties of Alumina-Coated Zirconia Ceramics	
A.L. Cui and K. Itatani	183
Creep Behavior of SiC Fibers at High Temperatures Using the BSR Method	
S. Shoji, Y. Katase and K. Okamura	187
Fabrication of Two-Dimensional SiC/SiC Composites by Hot-Pressing and their Mechanical, Interfacial and Thermal Properties	
K. Yoshida, K. Hashimoto, Y. Toda, S. Udagawa and T. Yano	191
Fabrication of Cr₃C₂-AlN-FeCr Cermet Coating by Combustion Synthesis	
H.P. Zhou, W.G. Li, K.X. Chen and L. Yin	195
Oxidation Properties of Three-Dimensional (3-D) Braided Carbon Fibers Coated with SiC	
P.Z. Gao, H.J. Wang and Z.H. Jin	199
Recent Advances in Continuous SiC Fibers and their Composites	
T. Ishikawa and H. Ichikawa	203
Characterization of Directionally Solidified $\text{B}_4\text{C}-\text{TiB}_2$ and $\text{B}_4\text{C}-\text{SiC}$ Eutectic Composites Prepared by Floating-Zone Method	
T. Akashi, I. Gunjishima and T. Goto	209
High-Strength and High-Toughness Porous Silicon Nitride for Structural Applications	
T. Ohji and Y. Inagaki	213
High-Strength Porous Silicon Nitride Fabricated by Partial Sinter-Forging	
N. Kondo, Y. Suzuki and T. Ohji	219
Reaction Bonding of Porous Mullite Ceramics	
J.H. She, J.F. Yang and T. Ohji	223
Highly Porous Silicon-Based Ceramics Fabricated with Restrained Sintering by Reaction Bonding (RSRB)	
J.F. Yang, J.H. She, G.J. Zhang, N. Kondo and T. Ohji	227

Fabrication of Porous Silicon Nitride and Characterisation of Mechanical Properties	231
A. Díaz and S. Hampshire	
Corrosion of Highly Thermal Conductive AlN Ceramics in Aqueous Solutions	235
C. Lin, J. Tatami, T. Meguro, K. Komeya, Y. Abe, M. Komatsu and M. Okamoto	
Features and Future Development of the Carbon-Containing Refractory	239
A. Yamaguchi	
Nonlinear Finite Element Analysis of Alumina-Magnesia Monolithic Refractory Lining Material	245
M. Sugawara, S. Hagiwara and M. Nakagaki	
Biaxial Fracture Loci of Isotropic Graphite and their Theoretical Analysis by Series-Parallel Link Model	251
Y. Matsuo, K. Yamamoto and K. Yasuda	
Damage Resistance and R-Curve Behavior of Laminated SiC/BN Ceramics	255
D.Y. Li, G.J. Qiao and Z.H. Jin	
Effect of Microstructural Variables on the Erosion of Silicon Nitride Ceramics	259
D.S. Park, H. Choi, D.H. Han, H.D. Kim, B.D. Han, D.S. Lim and I.S. Kim	
Grain Boundary Electronic Structure and High-Temperature Plastic Flow in Polycrystalline Al_2O_3	263
H. Yoshida, Y. Ikuhara and T. Sakuma	
High-Temperature Strength of Liquid-Phase-Sintered SiC Ceramics with Oxynitride Glass	267
Y.W. Kim, S.H. Kim, M. Mitomo and T. Nishimura	
Effect of Crack-Healing Process on Fatigue Strength of $\text{Si}_3\text{N}_4/\text{SiC}$ Ceramics at 1000°C	271
K. Hojo, K. Ando, M.C. Chu and S. Sato	
Crack-Healing Behavior of Silicon Nitride Ceramics under Cyclic Stress and Resultant Strength at Crack-Healed Temperature	275
K. Takahashi, K. Ando, S. Nakayama, H. Murase and S. Saito	
A New Interpretation of Stress Relaxation Behavior in Si_3N_4 Ceramics	279
T. Sakuma, Z.L. Hong, H. Yoshida, Y. Ikuhara, T. Nishimura and M. Mitomo	
The Role of Grain Morphology in Superplastic Deformation	283
H. Muto, Y. Takahashi and M. Sakai	
Damage to Brittle Coating Layer with Compliant Substrate from Concentrated Loads	287
C.S. Lee, J.H. Kim and D.K. Kim	
Wear Properties of SiAlON Ceramics	293
M.I. Jones, K. Hirao, H. Hyuga, S. Sakaguchi and Y. Yamauchi	
Application of Focused Ion Beam Miller in Fracture Characterization	297
Z.H. Xie, P.R. Munroe, M. Hoffman, R.J. Moon and Y.B. Cheng	
Friction Characteristics of C/C Composite Impregnated with Silicon	301
H.N. Ko, S. Hanzawa and N. Hashimoto	
Microstructure and Mechanical Properties of SiC/Mullite and SiC/ZTM Nanocomposites	305
L. Gao, X.H. Jin, H. Kawaoka, T. Sekino and K. Niihara	
Investigation of Fabrication and Properties of Machinable $\text{Si}_3\text{N}_4/\text{BN}$ Nanocomposite Ceramics	311
X.D. Wang, G.J. Qiao and Z.H. Jin	
Fabrication and Properties of Al_2O_3-SiAlON Composites with Nano-Sized t- and h-BN Dispersion	315
Y.L. Li, G.J. Qiao and Z.H. Jin	
Colloidal Self-Assembly of Ceramics: Interparticle Forces and Structural Control	319
S. Rödner, N. Andersson, P. Alberius and L. Bergström	
Dopant Distribution in Microstructure of Nb_2O_5-Doped SrTiO_3 Ceramics	323
P. Fang and H. Gu	
The Control of Intergranular Oxidation Brittleness in Silicon Carbides by Grain Boundary Engineering	327
S. Tsukada, T. Watanabe, H. Watanabe and N. Tamari	
Effects of Processing and Doping Elements on the Grain Boundary Microstructure and Mechanical Properties of SiC	331
S. Tsukada, Y. Naito, V.S.R. Murthy, T. Watanabe and N. Tamari	
Grain Boundary Characters and Structures in Oxide Ceramics	335
Y. Ikuhara, K. Matsunaga, T. Yamamoto and T. Sakuma	

Model Studies of Surfaces and Interfaces in Ceramics	341
M. Kitayama, T. Narushima, K. Tran, G. Gronsky and A.M. Glaeser	
Improvement in High-Temperature Properties of Al₂O₃ Ceramics by Microstructure and Grain Boundary Control	349
T. Mitsuoka, H. Yamamoto and S. Iio	
Study of the Thermal Conductivity of Si₃N₄ Sintered with CeO₂ and MgO Additives	355
W. Xu, X.S. Ning, H.P. Zhou, Y.B. Lin and K.X. Chen	
Microstructure and Thermal Conductivity of AlN Ceramic with Eliminated Grain Boundary Phase	361
K. Watari, H. Nakano, T. Tsugoshi, T. Nagaoka, K. Urabe, S. Cao, K. Mori and K. Ishizaki	
Study of Electrical Fatigue of Ferroelectric Ceramics	365
L.T. Li and N.X. Zhang	
Development of Textured Bismuth Titanate Piezoelectric Ceramics	371
Y.B. Cheng, Q.B. Yang, Y.M. Kan, P.L. Wang, Y.X. Li, Q.R. Yin and D.S. Yan	
Grain-Boundary Structural Transition and Sintering Behavior in Barium Titanate	377
S.Y. Choi, Y.I. Jung and S.J.L. Kang	
Variation of Electrical Properties of Sr_{0.8}Bi_{2+x}Ta₂O_{9+δ} Ferroelectric Thin Films with Bismuth Content	381
H. Chou, T.Y. Tseng and T. Chen	
Low-Temperature Co-Fired NPO-Type Ceramic Composition for High-Frequency Capacitor Applications	385
D.W. Kim, J.R. Kim, S. Cho, J.J. Bian and K.S. Hong	
Sintering and Properties of CaO-Al₂O₃-B₂O₃-SiO₂ System Glass Ceramics	389
S.H. Wang and H.P. Zhou	
Microstructure of Porous Sr-Doped Lanthanum Manganite Fabricated by Sol-Gel Process	393
S.C. Wang, H.Z. Hsu and W.C.J. Wei	
Preparation of Novel Nano-SiO₂-Gel Additive and Performance of PEM Fuel Cell	397
W. Cheng, Z.Q. Mao, J.M. Xu and X.F. Xie	
Chemical Modification of Niobium Pentaethoxide with Catechol	401
K. Egawa, K. Minami and Y. Sugahara	
Synthesis of Monodispersed ZnO Nanoparticles and their Luminescent Properties	405
A. Li, W. Wu, C. Kao and R.P.H. Chang	
Zinc Oxide Varistor Prepared by Low-Temperature Sintering of ZnO Nano-Powder and its Electrical Properties	411
T. Imataka, K. Miyamoto, A. Iga, H. Miyamoto and K. Okamura	
Material and CO Sensing Properties of SnO₂ Thick Films with Sol Stability Time	415
B.S. Park, W.S. Lee, K.J. Hong, D.C. Shin, E. Traversa, H.G. Kim and J.S. Park	
Porous TiO₂ Photocatalyst Films Prepared from Peroxo Titanic Acid Solution Dispersing Nano-Sized Silicate Layer	419
T. Watari, S. Taniguchi, T. Torikai, M. Yada and S. Furuta	
Preparation of Ordered Macroporous Ceramic Films Using PMMA Microspheres as Templates	423
T. Hyodo, K. Sasahara, Y. Shimizu and M. Egashira	
Preparation of Hollow Alumina Microspheres by Mechanofusion and Ultrasonic Spray Pyrolysis	427
M. Egashira, T. Kato, T. Hyodo and Y. Shimizu	
Preparation of Porous Ceramics from Rice Husk Containing Al or Al₂O₃ Particles for Bioreactor	433
T. Torikai, T. Ishibashi, K. Egoshi, M. Yada and T. Watari	
Chemically Bonded Ceramics as Biomaterials	437
L. Hermansson, L. Kraft and H. Engqvist	
A Study of Zero Thermal Expansion Ceramics	443
M. Iguchi, M. Kataoka, S. Kikuchi and M. Ishii	
The Present Status of the Synergy Ceramics Project	447
A. Tsuge	
Application Examples of Composite Materials	455
S. Hanzawa	

Current Trends in Ceramics for the Lighting Industry

G.C. Wei

461

Applications of Aluminum Nitride (AlN) Ceramics

N. Kuramoto and K. Takada

467