

Contents

Material Design and Mechanical Testing	
Performance of Fiber Reinforced Materials: Historic Perspective and Glance in the Future	3
Surendra Shah and Yuan Gao	
Micromechanics-Based Design of Strain Hardening Cementitious Composites (SHCC)	12
Junxia Li, Jishen Qiu, Shan He, and En-Hua Yang	
Derivation of Crack Bridging Stresses in Fiber Reinforced Cementitious Composites under Combined Opening and Shear Displacements	28
Chang Wu and Christopher K.Y. Leung	
Bridging Stress of Inclined Fiber in Cementitious Composites Based on Large Deflection Beam Theory	37
Jie Yao and Christopher K.Y. Leung	
The Effect of Fiber Orientation on the Mechanical Properties of SHCC	46
Cong Lu, Christopher K.Y. Leung, and Jinlong Pan	
Novel Experimental Method to Determine Crack-Bridging Constitutive Relationship of SHCC Using Digital Image Processing	55
Jing Yu and Christopher K.Y. Leung	
Healing of Interface Between Polyvinyl Alcohol (PVA) Fiber and Cement Matrix.	63
Jishen Qiu and En-Hua Yang	
Micromechanics of an Ultra Lightweight Engineered Cementitious Composite Containing Polymeric Latex Admixture	70
Qian Zhang and Victor C. Li	

Effects of Embedment Length and Angle of PVA-Fibers on Tensile Performance of FRC	79
Shota Yoneyama, Satoru Sakai, Takumi Kojima, Koichi Kobayashi, and Keitetsu Rokugo	
Evaluation of Shear and Tensile Bridging Characteristics of PVA Fibers Based on Bridging Law	88
Yuriko Ozu, Hiroshi Yamada, Akira Yasojima, and Toshiyuki Kanakubo	
A Multiscale Model for High Performance FRC	97
Jithender J. Timothy, Tagir Iskhakov, Yijian Zhan, and Günther Meschke	
Modelling and Experimental Characterization of the Tensile Response of Ultra-High Performance Fibre-Reinforced Cementitious Composites	106
Amin Abrishambaf, Mário Pimentel, and Sandra Nunes	
Mechanical Properties of Ductile Cementitious Composites Incorporating Microencapsulated Phase Change Materials	115
Erik Schlagen, Branko Šavija, Stefan Chaves Figueiredo, Fernando França de Mendonça Filho, and Mladena Luković	
A Comparative Study on Deflection-Hardening Behavior of Ductile Alkali-Activated Composite	123
Shizhe Zhang, Marija Nedeljković, Bahman Ghiassi, and Guang Ye	
Effectiveness of Fabricating High Performance Fiber Reinforced Cementitious Composite (HPFRCC) Using High Volume Steel Slag Powder	131
Xuanchun Wei, Xinhua Cai, Peng Wu, Jun Su, Zhen He, and Shengwen Tang	
Influence of Coarse Aggregate on the Mechanical Behavior of Strain Hardening Cementitious Composites	139
Naoshi Ueda and Atsushi Kawamoto	
Development of Cementitious Composites with Tensile Strain Capacity up to 10%	147
Kaili Zhan, Jiangtao Yu, Yichao Wang, and Kequan Yu	
Sustainable Fiber-Reinforced Strain-Hardening Composites Using Geopolymer as ‘Complete’ Replacement of Portland Cement	154
Behzad Nematollahi and Jay Sanjayan	
Strain Hardening Behaviour of Polyethylene Fibre Reinforced Ambient Air Cured Geopolymer Composite	162
Faiz Uddin Ahmed Shaikh and Anthony Fairchild	

Development of High Strength and High Ductility Cementitious Composites Incorporating CNF-Coated Polyethylene Fibers	172
Shan He, Jishen Qiu, Junxia Li, and En-Hua Yang	
Effect of Basalt Fibers on Mechanical Properties of High-Performance Concrete Containing Supplementary Cementitious Materials	181
Jisong Zhang, Yinghua Zhao, and Haijiang Li	
Effects of Nylon Fibre and Concrete Strength on the Shrinkage and Fracture Behaviour of Fibre Reinforced Concrete	188
Dogac S. Ozsar, Fatih Ozalp, H. Dilsad Yilmaz, and Burcu Akcay	
Development of a Steel-PVA Hybrid Fiber SHCC	195
Alok Abhay Deshpande, Dhanendra Kumar, Anandharam Mourougassamy, and Ravi Ranade	
Performance Analysis of Hybrid Fiber Reinforced High Volume Fly Ash Cement Composite.	203
Mahzabin Afroz, Indubhushan Patnaikuni, and Srikanth Venkatesan	
Physical and Mechanical Properties of Ultra-High Strength and High Ductility Cementitious Composites	211
Dong-Yi Lei and Li-Ping Guo	
Influence of Distribution Modulus of Particle Size Distribution on Rheological and Mechanical Properties of Ultra-High-Strength SHCC Matrix	221
Ketan A. Ragalwar, Hung Nguyen, Ravi Ranade, William F. Heard, and Brett A. Williams	
Mechanical Characteristics of Ultra High Performance Strain Hardening Cementitious Composites	230
Kequan Yu, Jiangtao Yu, and Zhoudao Lu	
Tensile Characterization of a “Eco-Friendly” UHPFRC with Waste Glass Powder and Glass Sand	238
Mohammed Mousa, Estefania Cuenca, Liberato Ferrara, Nathalie Roy, and Arezki Tagnit-Hamou	
Ecological and Mechanical Properties of Ultra High Performance – Fiber Reinforced Cementitious Composites Containing High Volume Fly Ash	249
Tomoya Nishiwaki, Keita Suzuki, Sukmin Kwon, Go Igarashi, and Alessandro P. Fantilli	
Influence of Fiber Type on the Tensile Behavior of Strain-Hardening Cement-Based Composites (SHCC) Under Impact Loading	257
Iurie Curosu, Viktor Mechtcherine, Daniele Forni, and Ezio Cadoni	

Effect of Strain Rate and Fiber Type on Tensile Behavior of High-Strength Strain-Hardening Cement-Based Composites (HS-SHCC)	266
Ali A. Heravi, Olga Smirnova, and Viktor Mechtcherine	
Interphases in Cementitious Matrix: Effect of Fibers, Sizings, and Loading Rates	275
Christina Scheffler, Serge Zhandarov, Enrico Wölfel, and Edith Mäder	
Development of a Proper Mix-Design for Impact Loading of Deflection Hardening Hybrid Fiber Reinforced Concrete	284
Mohammad Musa Alami, Tahir Kemal Erdem, Mert Yücel Yardımcı, and Serdar Aydın	
The Influence of Multiple Micro-cracking on the Electrical Impedance of an Engineered Cementitious Composite.	292
Danah Saraireh, Steve Walls, Benny Suryanto, Gerard Starrs, and W. John McCarter	
Combination of Digital Image Correlation and Acoustic Emission for Characterizing Failure Modes in Strain-Hardening Cement-Based Composites (SHCC)	300
Stephan M. Pirsawetz, Götz Hüsken, Iurie Curosu, and Viktor Mechtcherine	
Experimental Study of Tensile Response of Strain Hardening UHPFRC at Early Age.	308
Mohamed A. Hafiz and Emmanuel Denarié	
Determination of the Uniaxial Tensile Strength of Concrete with a Modified Test Setup	316
Christian Neunzig, Thomas Heiermann, and Michael Raupach	
Effect of Fiber Orientation and Specimen Thickness on the Tensile Response of Strain Hardening UHPFRC Mixes with Reduced Embodied Energy	324
Amir Hajiesmaeili and Emmanuel Denarié	
Effect of Temperature on Tensile Performance of PVA-SHCC	333
Keitetsu Rokugo, Daichi Hayashi, Koichi Kobayashi, S.C. Lim, and Hiroo Takada	
Effect of Styrene-Butadiene Copolymer Coating on Properties of Rubberized Cement-Based Composites	342
Ngoc Phuon Pham, Ahmed Toumi, and Anaclet Turatsinze	

Material Design of TRC and TRC Impact Resistance	351
Alva Peled	
Mechanics and Cracking Mechanisms in Natural Curauá Textile Reinforced Concrete	359
Leticia O. Souza, Lourdes M.S. Souza, and Flávio A. Silva	
Efficiency Increase of TRC by Using Textile Reinforcements from the Extended Warp Knitting Process	367
Enrico Lorenz and Regine Ortlepp	
Mechanical Performance of Flax Nonwoven-Calcium Aluminate Cement Composites.	375
Josep Claramunt, Lucia Fernandez-Carrasco, and Mònica Ardanuy	
Mechanical Behavior of Geopolymeric Composites Reinforced with Natural Fibers.	383
Ana Carolina Constâncio Trindade, Isadora Oliveira Moore Arêas, Daniela Costa Tabet de Almeida, Himad Ahmed Alcamand, Paulo Henrique Ribeiro Borges, and Flávio de Andrade Silva	
Improved Bonding of Carbon Fiber Reinforced Cement Composites by Mineral Particle Coating.	392
Roey Nadiv, Alva Peled, Viktor Mechtcherine, Simone Hempel, Danilo Nicke, and Christof Schroefl	
Experimental Investigation and Benchmarking of 3D Textile Reinforced Cementitious Composites.	400
Michael El Kadi, Svetlana Verbruggen, Jolien Vervloet, Matthias De Munck, Jan Wastiels, Danny Van Hemelrijck, and Tine Tysmans	
Numerical and Experimental Characterization of Anchorage Length for Textile Reinforced Concrete.	409
Jan Bielak, Yingxiong Li, Josef Hegger, and Rostislav Chudoba	
A Modelling Framework for the Tensile Behavior of Multiple Cracking Composite	418
Yingxiong Li, Rostislav Chudoba, Jan Bielak, and Josef Hegger	
Structural Design and Large-Scale Testing	
Performance-Based Design of SHCC Components – Research and Challenges	429
Christopher K.Y. Leung	
Flexural Behaviour of Reinforced Polyvinyl Alcohol-Engineered Cementitious Composite Beams	441
Dan Meng, C.K. Lee, and Y.X. Zhang	

Testing Procedure for Determining the Bond-Slip Law of Steel Bars in Strain Hardening Cementitious Composites	448
Androula V. Georgiou, Souzana P. Tastani, and Stavroula J. Pantazopoulou	
Analyzing SHCC Structures with an Efficient Discrete Model	457
Tiansheng Shi and Christopher K.Y. Leung	
Influence of Fiber Orientation on Structural Performance of Beam-Column Joints Using PVA FRCC	465
Yu Mu, Mai Ando, Akira Yasojima, and Toshiyuki Kanakubo	
Impact Performance of Low-Fiber Content HPFRCC: From Material to Structural Behavior	473
Carlos Zanuy and Gonzalo S.D. Ulzurrún	
Effect of Steel Fiber on the Behavior of Circular Steel Tube Confined UHPC Columns Under Axial Loading	482
An Le Hoang and Ekkehard Fehling	
Comparative Flexural and Tensile Behaviours of Ultra-High Performance Fibre Reinforced Concrete with Different Steel Fibres.	492
Kim Huy Hoang and Nguyen Viet Tue	
Pseudo Strain Hardening Behavior of Reinforced UHPFRC Member Under Uniaxial Tension.	502
Kazunari Sasaki, Ryota Mori, and Minoru Kunieda	
Simulation of Scattering of Bending Characteristics of FRCC Based on Bridging Law Considering Fiber Distribution	509
Toshiyuki Kanakubo, Keisuke Watanabe, and Yuriko Ozu	
Analysis and Design Procedures for Strain Hardening Flexural Beam and Panel	518
Yiming Yao, Narayanan Neithalath, and Barzin Mobasher	
Comparison of Double-Lap/Double-Prism and Single-Lap/Single-Prism Shear Tests for the TRM-to-Masonry Bond Assessment.	527
Paraskevi D. Askouni and Catherine (Corina) G. Papanicolaou	
Buckling Behaviour of Structural Insulating Sandwich Walls with Textile Reinforced Cement Faces.	535
Jolien Vervloet, Petra Van Itterbeeck, Svetlana Verbruggen, Michael El Kadi, Matthias De Munck, Jan Wastiels, and Tine Tysmans	
Tensile and Direct Shear Responses of Basalt-Fibre Reinforced Mortar Based Materials	544
Antonio Iorfida, Salvatore Verre, Sebastiano Candamano, and Luciano Ombres	

Thermo-Mechanical Characterization of Textile Reinforced Concrete. Application to Short Concrete Column Strengthening Submitted to Fire Conditions	553
Patrice Hamelin, Zyed Mesticou, and Amir Si Larbi	
Durability and Durability Design	
The Effect of Crack Patterns on the Corrosion of Steel Reinforced SHCC	565
Gideon P.A.G. van Zijl and William P. Boshoff	
Assessing the Performance of Engineered Cementitious Composites Under Cyclic Wetting and Drying	573
Benny Suryanto, W. John McCarter, Gerard Starrs, and Marcin Jablonski	
Layered SHCC with Crack and Diffusion Control for Improved Durability of Concrete Structures	582
Pavel Trávníček and Tatsuya Tsubaki	
Water Permeability and Capillary Absorption of Cracked SHCC	591
Christian Wagner, Beate Villmann, and Volker Slowik	
Self-healing of Cracks in Strain Hardening Cementitious Composites Under Different Environmental Conditions	600
Peng Zhang, Folker H. Wittmann, Sulei Zhang, Harald S. Müller, and Tiejun Zhao	
Influence of Damage on the Effectiveness of SHCC Covers for Reducing Corrosion Rates in Reinforced-Concrete Structural Elements	608
Hamidreza Fakhri, Yao Han, and Ravi Ranade	
Closure of Cracks and Reduction of Permeability in SHCC Using Silicate-Based Surface Penetrants	616
Koichi Kobayashi and Haruka Sanbongi	
Rebar Corrosion Protection Performance of Shotcreted SHCC with Bending Cracks	625
Yusuke Hattori and Koichi Kobayashi	
Strain Resilient Cementitious Composites of Unclassified Calcareous Fly Ash and PP Fibers: Performance by also Considering Durability Effects	634
Souzana Tastani, Evangelia Ntampali, Ioannis Savvidis, Maria Veneti, and Vasileios Zapis	

Chloride-Induced Corrosion of Cracked Cement-Based Composites. . .	643
Gideon P.A.G. van Zijl, Schalk R. Bezuidenhout, and Algurmon S. van Rooyen	
Compressive Performance of TRC-Strengthened Column with Small Eccentricity Under Chloride-Wet-Dry Cycles	651
Shi-Ping Yin, Qian-Xiang Hu, and Chi Peng	
Influence of Weathering Conditions on TRC Sandwich Renovation Panels.	659
Matthias De Munck, Tine Tysmans, Svetlana Verbruggen, Jolien Vervloet, Michael El Kadi, Jan Wastiels, and Olivier Remy	
Strengthening, Repair and Other Applications	
Applications of SHCC in Japan – Tools and Tips for Promoting its Use	671
Keitetsu Rokugo	
Performance Enhancement of Concrete Structures Through Multi-scale Crack Control	681
Gabriel Jen and Claudia Ostertag	
Use of Strain-Hardening Cement-Based Composites (SHCC) in Real Scale Applications	690
Steffen Müller and Viktor Mechtcherine	
Use of High Strength SHCC for the Repair of Concrete Structures with Significant Steel Reinforcement Corrosion	701
Yixin Chen, Jing Yu, and Christopher K.Y. Leung	
Piezoresistive Properties of Cementitious Composites Reinforced by PVA Fibres.	709
Stefan Chaves Figueiredo, Oğuzhan Çopuroğlu, Branko Šavija, and Erik Schlangen	
Experimental Investigation for Fire Safety of Full Scale ECC Coupling Beam	718
Tetsushi Kanda, Siro Tomoe, and Keiichi Miyamoto	
Study on Effect of Heat Elimination by Pipe Cooling System in Beam Using High Strength Engineered Cementitious Composites . . .	725
Toshiaki Mizobuchi, Tetsushi Kanda, and Minoru Kunieda	
Cyclic Loading Test on 0.2-Scale RC Column Models Repaired by Strain-Hardening Fiber-Reinforced Cement-Based Composites	734
Shogo Yamamoto, Yoshitomo Yano, Koji Kinoshita, Seungchan Lim, and Kazuhide Shinya	

Strengthening and Repair with Carbon Concrete Composites – the First General Building Approval in Germany	743
Silke Scheerer, Elisabeth Schütze, and Manfred Curbach	
An Innovative Structural and Energy Retrofitting System for Masonry Walls Using Textile Reinforced Mortars Combined with Thermal Insulation	752
Thanasis Triantafillou, Kyriakos Karlos, Kalliopi Kefalou, and Eirini Argyropoulou	
Pultruded Textile Reinforced Concrete Structural Shapes.	762
Jacob Bauchmoyer, Dafnik S.K. David, Himai Mehere, Vikram Dey, and Barzin Mobasher	
Effect of Confinement with FRCM Composites on Damaged Concrete Cylinders	770
Jaime Gonzalez-Libreros, Cristian Sabau, Lesley H. Sneed, Gabriel Sas, and Carlo Pellegrino	
Performance of Different Types of FRCM Composites Applied to a Concrete Substrate	778
Tommaso D’Antino, Jaime Gonzalez-Libreros, Carlo Pellegrino, Christian Carloni, and Lesley H. Sneed	
Author Index.	787

Strain-Hardening Cement-Based Composites
SHCC4

Mechtcherine, V.; Slowik, V.; Kabele, P. (Eds.)

2018, XXVII, 789 p. 548 illus., Hardcover

ISBN: 978-94-024-1193-5