

# Contents

## Plenary Papers

Potential Environmental and Human Health Impacts of Nanomaterials Used in the Construction Industry .....	1
<i>J. Lee, S. Mahendra, P.J.J. Alvarez</i>	
Nanotechnology in Construction: A Roadmap for Development .....	15
<i>P.J.M. Bartos</i>	
The Colloid/Nanogranular Nature of Cement Paste and Properties .....	27
<i>H. Jennings</i>	
Nanotechnology and Cementitious Materials .....	37
<i>K.L. Scrivener</i>	
Probing Nano-structure of C-S-H by Micro-mechanics Based Indentation Techniques .....	43
<i>F.-J. Ulm, M. Vandamme</i>	

## Keynote Papers

Innovative Building Material – Reduction of Air Pollution through TioCem® .....	55
<i>G. Bolte</i>	
Nanomechanical Explorations of Cementitious Materials: Recent Results and Future Perspectives .....	63
<i>G. Constantinides, J.F. Smith, F.-J. Ulm</i>	

<b>Developments in Metrology in Support of Nanotechnology .....</b>	71
<i>J.E. Decker, A. Bogdanov, B.J. Eves, D. Goodchild, L. Johnston, N. Kim, M. McDermott, D. Munoz-Paniagua, J.R. Pekelsky, S. Wingar, S. Zou</i>	
<b>Concrete Nanoscience and Nanotechnology: Definitions and Applications .....</b>	81
<i>E.J. Garboczi</i>	
<b>Continuum Microviscoelasticity Model for Cementitious Materials: Upscaling Technique and First Experimental Validation .....</b>	89
<i>S. Scheiner, C. Hellmich</i>	
<b>Production, Properties and End-Uses of Nanofibres .....</b>	95
<i>O. Jirsák, T.A. Dao</i>	
<b>The Fractal Ratio as a Metric of Nanostructure Development in Hydrating Cement Paste .....</b>	101
<i>R.A. Livingston, W. Bumrongjaroen, A.J. Allen</i>	
<b>A Review of the Analysis of Cement Hydration Kinetics via <math>^1\text{H}</math> Nuclear Magnetic Resonance .....</b>	107
<i>J.O. Ojo, B.J. Mohr</i>	
<b>Analysing and Manipulating the Nanostructure of Geopolymers .....</b>	113
<i>J.L. Provis, A. Hajimohammadi, C.A. Rees, J.S.J. van Deventer</i>	
<b>Nanotechnology Applications for Sustainable Cement-Based Products .....</b>	119
<i>L. Raki, J.J. Beaudoin, R. Alizadeh</i>	
<b>Nanoscale Modification of Cementitious Materials .....</b>	125
<i>S.P. Shah, M.S. Konsta-Gdoutos, Z.S. Metaxa, P. Mondal</i>	
<b>Progress in Nanoscale Studies of Hydrogen Reactions in Construction Materials .....</b>	131
<i>J.S. Schweitzer, R.A. Livingston, J. Cheung, C. Rolfs, H.-W. Becker, S. Kubsky, T. Spillane, J. Zickefoose, M. Castellote, N. Bengtsson, I. Galan, P.G. de Viedma, S. Brendle, W. Bumrongjaroen, I. Muller</i>	
<b>Engineering of <math>\text{SiO}_2</math> Nanoparticles for Optimal Performance in Nano Cement-Based Materials .....</b>	139
<i>K. Sobolev, I. Flores, L.M. Torres Martinez, P.L. Valdez, E. Zarazua, E.L. Cuellar</i>	

**Regular Papers**

<b>Improving the Performance of Heat Insulation Polyurethane Foams by Silica Nanoparticles .....</b>	149
<i>M.M. Alavi Nikje, A. Bagheri Garmarudi, M. Haghshenas, Z. Mazaheri</i>	
<b>Eco-innovation Strategies in the Construction Sector: Impacts on Nanotech Innovation in the Window Chain .....</b>	155
<i>M.M. Andersen, M. Molin</i>	
<b>Interpretation of Mechanical and Thermal Properties of Heavy Duty Epoxy Based Floor Coating Doped by Nanosilica .....</b>	163
<i>M.M. Alavi Nikje, M. Khanmohammadi, A. Bagheri Garmarudi</i>	
<b>Nanoindentation Study of Na-Geopolymers Exposed to High Temperatures .....</b>	169
<i>I. Beleña, W. Zhu</i>	
<b>Nanoscale Agent Based Modelling for Nanostructure Development of Cement .....</b>	175
<i>E. Cerro-Prada, M.J. Vázquez-Gallo, J. Alonso-Trigueros, A.L. Romera-Zarza</i>	
<b>CHH Cement Composite .....</b>	181
<i>A. Cwirzen, K. Habermehl-Cwirzen, L.I. Nasibulina, S.D. Shandakov, A.G. Nasibulin, E.I. Kauppinen, P.R. Mudimela, V. Penttala</i>	
<b>Modeling of Nanoindentation by a Visco-elastic Porous Model with Application to Cement Paste .....</b>	187
<i>D. Davydov, M. Jirásek</i>	
<b>Multi-scale Study of Calcium Leaching in Cement Pastes with Silica Nanoparticles .....</b>	193
<i>J.J. Gaitero, W. Zhu, I. Campillo</i>	
<b>Nanotechnologies for Climate Friendly Construction – Key Issues and Challenges.....</b>	199
<i>M.M. Andersen, M.R. Geiker</i>	
<b>The Potential Benefits of Nanotechnology for Innovative Solutions in the Construction Sector .....</b>	209
<i>F.H. Halicioglu</i>	

<b>Use of Nano-SiO<sub>2</sub> to Improve Microstructure and Compressive Strength of Recycled Aggregate Concretes .....</b>	215
<i>P. Hosseini, A. Booshehrian, M. Delkash, S. Ghavami, M.K. Zanjani</i>	
<b>The Effect of Various Process Conditions on the Photocatalytic Degradation of NO .....</b>	223
<i>G. Hüskens, M. Hunger, M.M. Ballari, H.J.H. Brouwers</i>	
<b>Molecular Dynamics Approach for the Effect of Metal Coating on Single-Walled Carbon Nanotube .....</b>	231
<i>S. Inoue, Y. Matsumura</i>	
<b>Polymer Nanocomposites for Infrastructure Rehabilitation .....</b>	241
<i>M.R. Kessler, W.K. Goertzen</i>	
<b>Nanotechnology Divides: Development Indicators and Thai Construction Industry .....</b>	251
<i>T. Kitisriworaphan, Y. Sawangdee</i>	
<b>Improvement of Cementitious Binders by Multi-Walled Carbon Nanotubes .....</b>	261
<i>T. Kowald, R. Trettin</i>	
<b>Effect of Nano-sized Titanium Dioxide on Early Age Hydration of Portland Cement .....</b>	267
<i>A.R. Jayapalan, B.Y. Lee, K.E. Kurtis</i>	
<b>Nano-modification of Building Materials for Sustainable Construction .....</b>	275
<i>M. Kutschera, T. Breiner, H. Wiese, M. Leitl, M. Bräu</i>	
<b>Study of P-h Curves on Nanomechanical Properties of Steel Fiber Reinforced Mortar .....</b>	281
<i>S.F. Lee, J.Y. He, X.H. Wang, Z.L. Zhang, S. Jacobsen</i>	
<b>Evolution of Phases and Micro Structure in Hydrothermally Cured Ultra-High Performance Concrete (UHPC) .....</b>	287
<i>C. Lehmann, P. Fontana, U. Müller</i>	
<b>Interparticle Forces and Rheology of Cement Based Suspensions .....</b>	295
<i>D. Lowke</i>	
<b>Nanocomposite Sensing Skins for Distributed Structural Sensing .....</b>	303
<i>J.P. Lynch, K.J. Loh, T.-C. Hou, N. Kotov</i>	

Contents	XIII
<b>Utilization of Photoactive Kaolinite/TiO<sub>2</sub> Composite in Cement-Based Building Materials .....</b>	309
<i>V. Matějka, P. Kovář, P. Bábková, J. Přikryl, K. Mamulová-Kutláková, P. Čapková</i>	
<b>Nanomechanical Properties of Interfacial Transition Zone in Concrete .....</b>	315
<i>P. Mondal, S.P. Shah, L.D. Marks</i>	
<b>Mitigation of Leachates in Blast Furnace Slag Aggregates by Application of Nanoporous Thin Films .....</b>	321
<i>J.F. Muñoz, J.M. Sanfilippo, M.I. Tejedor, M.A. Anderson, S.M. Cramer</i>	
<b>Possible Impacts of Nanoparticles on Children of Thai Construction Industry .....</b>	329
<i>W. Musikaphan, T. Kitisriworaphan</i>	
<b>Characterization of Alkali-Activated Fly-Ash by Nanoindentation .....</b>	337
<i>J. Němeček, V. Šmilauer, L. Kopecký</i>	
<b>Multi-scale Performance and Durability of Carbon Nanofiber/Cement Composites .....</b>	345
<i>F. Sanchez, L. Zhang, C. Ince</i>	
<b>Nano-structured Materials in New and Existing Buildings: To Improved Performance and Saving of Energy .....</b>	351
<i>F. Scalisi</i>	
<b>Stability of Compressed Carbon Nanotubes Using Shell Models .....</b>	357
<i>N. Silvestre, D. Camotim</i>	
<b>Bending Instabilities of Carbon Nanotubes .....</b>	365
<i>N. Silvestre, D. Camotim</i>	
<b>Effect of Surface Roughness on the Steel Fibre Bonding in Ultra High Performance Concrete (UHPC) .....</b>	371
<i>T. Stengel</i>	
<b>Geotechnical Properties of Soil-Ball Milled Soil Mixtures ....</b>	377
<i>M.R. Taha</i>	
<b>Mortar and Concrete Reinforced with Nanomaterials .....</b>	383
<i>J. Vera-Agullo, V. Chozas-Ligero, D. Portillo-Rico, M.J. García-Casas, A. Gutiérrez-Martínez, J.M. Mieres-Royo, J. Grávalos-Moreno</i>	

<b>Experimental Study and Modeling of the Photocatalytic Oxidation of NO in Indoor Conditions .....</b>	389
<i>Q.L. Yu, H.J.H. Brouwers, M.M. Ballari</i>	
<b>Spray Deposition of Au/TiO<sub>2</sub> Composite Thin Films Using Preformed Nanoparticles .....</b>	395
<i>W. Wang, K. Cassar, S.J. Sheard, P.J. Dobson, P. Bishop, I.P. Parkin, S. Hurst</i>	
<b>Nanoindentation Study of Resin Impregnated Sandstone and Early-Age Cement Paste Specimens .....</b>	403
<i>W. Zhu, M.T.J. Fonteyn, J. Hughes, C. Pearce</i>	
<b>Posters</b>	
<b>Heterogeneous Photocatalysis Applied to Concrete Pavement for Air Remediation .....</b>	409
<i>M.M. Ballari, M. Hunger, G. Hüskens, H.J.H. Brouwers</i>	
<b>Synthesis of <math>\alpha</math>-Al<sub>2</sub>O<sub>3</sub> Nanopowder by Microwave Heating of Boehmite Gel .....</b>	415
<i>T. Ebadzadeh, L. Sharifi</i>	
<b>Effects of Sabalan Tuff as a Natural Pozzolan on Properties of Plastic Concrete .....</b>	419
<i>R. Sadeghi Doodaran, M. Pasbani Khiavi</i>	
<b>Synergistic Action of a Ternary System of Portland Cement – Limestone – Silica Fume in Concrete.....</b>	425
<i>J. Zelić, D. Jozić, D. Krpan-Lisica</i>	
<b>Author Index .....</b>	435