## **Table of Contents**

Preface, Committees and Editorial Team, Organizers and Supporting Organizations

## **Keynote Papers**

Are Polymer Concrete Materials and Products Really Sustainable? D.W. Fowler	3
Mechanical Behaviour of Engineered Cementitious Composites under Quasi-Static and	
High Strain Rate Applications K.H. Tan, E.H. Yang, S.B. Kang and T.Y. Wahyudi	10
Merging Cement Concrete, Concrete-Polymer Composites and Inorganic Polymer Technologies for Sustainability in Construction and Restoration D. Van Gemert and Ö. Cizer	19
Application of Non-Destructive Methods for Quality Control of Concrete Repair Efficiency A. Garbacz	28
Novel Geopolymers Incorporating Wollastonite and Recycled Mixed Plastics S.F. Wong, S.K. Ting, M. Lin, M. Shamini and B.K. Tay	39
Use of Polymers to Enhance Concrete Performance L. Czarnecki	49
Status of Research and Application of Concrete-Polymer Composites in China R. Wang, G. Wang and P. Wang	59
FRP Strengthening of Discontinuous Members K.H. Tan	69
Influence of Re-Dispersible Powders on Very Early Shrinkage in Functional Mortars T.A. Bier, A. Bajrami, T. Westphal, E. Qoku and A. Qorllari	77
The Effect of Polymer Emulsion Addition on the Setting Time, Crack Formation and Strength of Cementitious Patch Repair Mortars  D. Kruger, N. Herbst and J. Bester	86
Monitoring Fatigue Damage in PC Using Carbon Nanotubes  A. Garner, M. Genedy, R. Tarefder and M.R. Taha	94
Recent Development and Application of Polymers in Concrete Technology in Singapore N. Tao, X. Li and J.P. Lu	102
The Effect of Nano-Silica Particles on Fresh and Hardened State Properties of Polymer Cement Mortars N. Zabihi and M.H. Ozkul	113
Chapter 1: Polymers in Concrete - Concrete Polymer Composite (C-PC)	
Chemical Resistance of Concrete-Polymer Composites – Comparison Based on	
<b>Experimental Studies</b> T. Piotrowski and P. Gawroński	123
Polymers in Concrete – The Shielding against Neutron Radiation T. Piotrowski, D.B. Tefelski, M. Mazgaj, J. Skubalski, A. Żak and J.J. Sokołowska	131
Coefficient of Thermal Expansion of Polymer Concrete with Different Polymeric Binders K.S. Yeon, K.K. Kim, C.Y. Kim and J.H. Yeon	139
Comparative Study on the Elastic Modulus of Polymer Concrete K.S. Yeon, K.K. Kim, C.Y. Kim and J.H. Yeon	145
Determination of Polymer Type and Content in Concrete Materials by FTIR and TGA T. Tokura, J. Lim, A.M. Chua, W.L. Lee and J. Wong	151
Development and Application of PIC Form K. Okamoto, K. Tsuruta and T. Naitou	159
Influence of Coagulation of Polymer Dispersion on the Properties of Polymer-Modified Mortar Y. Cai, P.M. Wang and S.Y. Zhong	162
,	

Properties of VA/E/MMA Terpolymer Powder-Modified Mortars S. Hong and W.K. Kim	169
Testing and Specification of Polymer Concrete Materials in Singapore J.P. Lu	177
The Properties of Polymer-Modified Mortars Using Pozzolana Active Admixtures N. Žižková, R. Drochytka and P. Bayer	185
Effects of HEMC Powder and PP Fiber on the Drying Shrinkage of Cement Mortar X.J. Yang, P.M. Wang, S.W. Ming and L.F. Liu	193
Evaluation of Coating Properties Produced with Polyester Resins and Industrially Processed Components  A.C.R. Sacco and J.P. Gorninski	201
Use of Polishing Alumina as Flame Retardant in Orthophthalic Polyester Resin Matrix Composites	201
J.P. Ĝorninski, K.G. Tonet and J.J. Sokołowska	209
Study on Crack Bridging Ability of Polymer-Modified Cement Based Compounds for Waterproofing Material H. Zhao, W. Li and Y.M. Zhang	217
Curing of Polymer-Cement Concrete – Search for a Compromise	217
P. Łukowski, P. Woyciechowski, G. Adamczewski, M. Rudko and K. Filipek	222
<b>Chapter 2: Polymer Coatings and Polymer Reinforcement of Concrete</b>	
BFRP Bars as an Alternative Reinforcement of Concrete Structures - Compatibility and Adhesion Issues	
A. Garbacz, M. Urbański and A. Łapko	233
Comparison and Evaluation of Retrofitting Different Modes of Concrete Structures by FRP H. Makhdoumi, S.H. Madani, M. Shahraki, M. Khodarahmi and N. Nosratzehi	242
Economic Aspect of Hybrid Fiber Reinforced Composite D.Y. Han, M.C. Han, S.H. Yang and C.G. Han	249
Improvement of the Adhesion between Epoxy-Based Surface Coating and Hydrophobic Impregnated Concrete S. Kumagai, H. Sakuraba, A. Miyata, I. Sasaki and I. Nishizaki	256
Influence of Acrylic Emulsion on Polymer-Cement Waterproof Coating Y.J. Jiang, L. Li, H.S. Wang, R. Wang and Q. Tian	263
Influence of Film Thickness and Ambient Temperature to the Protective Performance of Surface Coating Material	
H. Sakuraba, A. Miyata, S. Kumagai, I. Sasaki and I. Nishizaki	270
New Applications for Polymer Overlays D.P. Whitney and D.W. Fowler	277
Fiber Reinforced Polymers in Civil Engineering: Durability Issues M. Frigione	283
Advanced Active Prestressed CFRP in RCC Structures G.L. Rai	290
Serviceability Behavior of Reinforcement Concrete Beams with Polypropylene and Steel Fibers	
N. Kabashi, C. Krasniqi, R. Hadri, V. Nushi and A. Dautaj	298
<b>Chapter 3: Use of Polymers to Enhance Concrete Performance</b>	
Apparent vs. True Bond Strength of Steel and PC with Nanoalumina A.E. Douba, M. Genedy, E. Matteo, J. Stormont and M.R. Taha	307
Comparison of Ordinary Pores with Internal Cured Pores Produced by Superabsorbent Polymers	315
J. Yang, F.Z. Wang and Y.P. Liu  Current Status of Expansion Joints Used for Road Bridges in Japan and an Advanced	313
Buried Joint M. Kawakami, F. Omata and A. Toyoda	323

Effect of Latex Film Distributions on Flexibility of Redispersible Polymer Powders Modified Cement Mortar Evaluated by SEM G.R. Zhao, P.M. Wang and G.F. Zhang	331
Effects of Long-Term Dry Curing on Strength Development of Initially Combined Wet/Dry-Cured and Steam-Cured Hardener-Free Epoxy-Modified Mortars M. Ota, T. Ohkubo, M. Ochi and Y. Ohama	339
Influences and Properties of Mortar Modified by Waterborne Polyurethane Latexes R. Wang, L. Li, W. Wang, H.S. Wang, Y.J. Jiang and D.P. Shen	345
Strengthening of Column Stump Using Glass Fiber Composite Strengthening System J.P. Lu, K.H. Tan and D. Zheng	353
The Performance of Low Air-Entraining Polycarboxylate Superplasticizer N. Li and B. Ding	361
Innovative Applications of Steel Fibres in Concrete Flange of Composite Beam Subjected to Combined Negative Bending and High Axial Tension M. Bavan, S. bin Baharom and S.A. Osman	367
Innovative Applications of Steel Fibres on Composite Beam with Profiled Plain Concrete Flange Subjected to Combined Negative Bending and Axial Tension M. Bavan, S. bin Baharom and S.A. Osman	375
Chapter 4: Polymers for Repair of Concrete	
A Functional Polymer Cement Mortar for Repair of Partially Damaged Asphalt Pavement S. Shimizu, H. Fujiwara, M. Maruoka and T. Matsumura	385
Analytical Model for Assessing Reinforced Beams I. Andreolli, L.d.A. Bernardo, M.W. Tocantins and R.H. Ruschel	393
Application of Wedge Splitting Test for Evaluation of the Bond Strength in Repair System Alumina Cement Concrete vs. PCC Mortar B. Chmielewska, G. Adamczewski, R. Wang, Z.H. Yang and P. Wang	401
Concrete Crack Repair with Polymer Modified Materials - The Need for Specialized Training of Applicators, Suppliers, Consultants and Clients J. Bester and D. Kruger	409
The Need to Uplift Quality Control and Quality Assurance for Specialized Concrete Crack Repair in the South African Construction Industry J. Bester and D. Kruger	416
Concrete Crack Repair with Polymer Modified Mortars: The Status Quo in the South African Construction Industry and the Way Forward  J. Bester and D. Kruger	422
Crack Propagation Analysis of Polymer Mortars Brazilian Disc Specimens Containing Cracks under Compressive Line Loading	429
Hard and Soft: Toughening Concrete by Impregnation with Functional Elastomers O. Weichold and M. Puterman	438
Tensile Properties of Polymer Repair Materials - Effect of Test Parameters Z. Kamil, G. Andrzej, C. Sandra and A.J. Barroso	445
Efficient Repair of Crack in SFRC with Low-Viscosity Epoxy Adhesive J. Šušteršič, A. Zajc, J. Korla and I. Leskovar	453
Sprayed Polymer Concrete for the Rehabilitation of Sewage Systems R. Schulte Holthausen and M. Raupach	460
Use of Polymer for Rehabilitation of Uneven Settlement in Concrete Roadbed Slabs of Tunnels J. Liu, X.G. Zheng, S.M. Li, Z. Zeng, D.J. Yang, Z.C. Weng and X.H. Liu	468
	700
Chapter 5: Use of Polymers in Green Building Materials	
Deformability of Mortars Incorporating Polyurethane Foam Waste under Cyclic Compression Fatigue Tests C. Junco, A. Rodríguez, J. Gadea and V. Calderón	477

Development of Polymer Concrete with Non-Standardised Fillers for Innovative Building Materials	
A. Osburg, A. Gypser and M. Ulrich	484
Interactions between Non-Ionic Additives and Cement Phases U. Schirmer and A. Osburg	492
Development of Polymer Modified Rice Husk Ash Concrete (PMRHAC)  A. Saand, D.K. Bangwar and M.A. Kerio	500
Durability Performance of Polymeric Waste Crumb Rubber as Fine Aggregates Replacement in Concrete	500
D.S.Q. Abg Adenan and K. Kamaruddin  Effect of Perlite Waste Powder on Chemical Resistance of Polymer Concrete Composites  J.J. Sokołowska, P.P. Woyciechowski, P. Łukowski and K. Kida	508 516
Manufacture of High-Performance Concrete Made with Powdered Polyester Resin Waste and Carboxylic-Ester Based Superplasticizer	
A. Rodríguez, P.L. Campos, J. Garabito, J. García and I. Santamaría	523
Influences of Mixing Procedure on Properties of Fresh Latex Modified Cement Paste(I) D.D. Han, W.D. Chen and S.Y. Zhong	530
Influences of Latex and Mixing Procedure on Mechanical Properties of Hardened Cement Paste(II)	
D. Han, W. Chen and S. Zhong	538
Influence of Superplasticizers on the Properties of Lightweight Mortar Plaster Made with Recycled Polymers	
J. Garabito, L. Alameda, J. Gadea and S. Gutiérrez-González	546
Chapter 6: Use of Polymers in Sustainable Construction and Development	
Restoration of Historic Concrete Structures with Modern Materials - A Case Study A. Gypser, A. Flohr and A. Osburg	557
Development of Foam One-Part Geopolymers with Enhanced Thermal Insulation Performance and Low Carbon Dioxide Emissions Z. Abdollahnejad, F. Pacheco-Torgal and J.B. de Aguiar	565
Performance of a Fly Ash Geopolymeric Mortar for Coating of Ordinary Portland Cement Concrete Exposed to Harsh Chemical Environments W. Tahri, Z. Abdollahnejad, J. Mendes, F. Pacheco-Torgal and J.B. de Aguiar	573
Lightweight Polyurethane Mortar with Structural Properties V. Calderón, M. Horgnies, R. Arroyo, A. Rodríguez and S. Gutiérrez-González	581
Longitudinal Thermal Movement of Polymer Concrete Irrigation Aqueducts K.S. Yeon, J.Y. Hwang, C.Y. Kim and J.H. Yeon	586
Properties of Foamed Concrete Using Polymer Based Foaming Admixture J.S. Sun and J.M. Kim	593
Restoration of Glass Panel – Reinforced Concrete Grillage Roof Shell of Ensor Gallery in Ostend (B)	
S. Ignoul and D. Van Gemert	599
Strength and Sulfuric Acid Resistance of Three Component Geopolymer H. Goda, K. Harada, S. Tsugo and M. Hibino	607
Utilization of Fly Ash with Higher Loss on Ignition for Geopolymer Mortar Y. Sagawa, S. Ota, K. Harada, T. Nishizaki and H. Goda	614
Sustainable Mortars with Incorporation of Microencapsulated Phase Change Materials S. Cunha, J. Aguiar, K. Zalegowski, A. Garbacz, P. Soares, J. Azevedo, V. Ferreira and A. Tadeu	621