

Table of Contents

Preface

Mechanical Properties and Durability of Bamboo Fibers/Bamboo-Fiber-Mixed Spray Mortar for Slope Protection K. Fujiyoshi, T. Ueda, H. Takagi and M. Tsukagoshi	1
Experimental Investigation on Mechanical and Acoustic Performance of Miscanthus - Lime Composites F. Ntimugura, R. Vinai, A. Harper and P. Walker	12
An Experimental Investigation on Suitability of Using Sisal Fibers in Reinforced Concrete Composites J.K. Makunza and G.S. Kumaran	24
Analyse of the Evolution of the Hygrothermal Properties of the Hemp-Based Mortar within the Framework of the Total Weathering Protocol D. Kosiachevskiy, K. Abahri, A. Daubresse, E. Prat and M. Chaouche	35
Thermal Insulation Blocks Made of Sunflower Pith Particles and Polysaccharide-Based Binders: Influence of Binder Type and Content on Their Characteristics A. Laborel-Préneron, C. Ampe, L. Labonne, C. Magniont and P. Evon	43
Effects of 0-30% Wood Ashes as a Substitute of Cement on the Strength of Concretes T.G. Bikoko, J.C. Tchamba, V.Y. Katte and D.K. Deh	51
Influence of High Temperatures on the Mechanical Properties of Wood Bio-Concretes A.L.D. Aguiar, M.Y.R. da Gloria and R.D. Toledo Filho	61
Environmental Performance of Wood Bioconcretes with Different Wood Shavings Treatments A.L.D. Aguiar, C.G. Bezerra, L.R. Caldas, A.S. Bernstad and R.D. Toledo Filho	69
Comprehensive Characterization of Agricultural By-Products for Bio-Aggregate Based Concrete H.H. Ratsimbazafy, A. Laborel-Préneron, C. Magniont and P. Evon	77
Experimental Study on Restoration of Deteriorated Timber due to Termites by Resin Filling T. Yajima, K. Imamoto, C. Kiyohara and M. Yamada	85
Natural Fibers vs. Synthetic Fibers Reinforcement: Effect on Resistance of Mortars to Impact Loads M. Saad, V. Sabathier and A. Turatsinze	95
Effect of Natural and Polypropylene Fibers on early Age Cracking of Mortars M. Saad, V. Sabathier, A. Turatsinze and S. Geoffroy	103
Mechanical Properties of Rammed Earth Stabilized with Local Waste and Recycled Materials A.E. Losini, L. Lavrik, M. Caruso, M. Woloszyn, A.C. Grillet, G. Dotelli and P. Gallo Stampino	113
Life Cycle Assessment of Circular Bio-Based Construction V. Cascione, M. Roberts, S. Allen, B. Dams, D. Maskell and A. Shea	124
Water Sensitivity of Hemp-Foam Concrete A. Mohamad, F. Khadraoui, N. Sebaibi, M. Boutouil and D. Chateigner	135
Seashells and Oyster Shells: Biobased Fine Aggregates in Concrete Mixtures G. Scuderi	146
Experimental Analysis of the Behavior of Straw Biocomposite Exposed to High Temperature C. Achour, N. Belayachi and B. Ismail	156
Experimental Investigation of the Compatibility of Lime Coating with Insulation Straw Biocomposite O. Bahou, N. Belayachi and B. Ismail	164
Assessment of the Influence of the Type of Filler Materials on the Properties of Cement Grouts A. Abdalqader, M. Sonebi, N. Thornton and S. Taylor	171
Comparative Study of Metakaolin and Zeolite Tuff Influence on Properties of High-Strength Concrete L.I. Dvorkin, V. Zhitkovsky, N. Lushnikova and M. Sonebi	179

Thermal and Moisture Buffering Properties of Novel Hemp-Lime Composites Integrated with Microencapsulated Phase Change Materials Y. Abdellatef, M. Kavgic and R. Foruzanmehr	186
Experimental and Numerical Study of Hygrothermal Behaviour of a Washing Fines Hemp Test Wall N. Boumediene, F. Collet, S. Prétot, L. Ayed and S. Elaoud	195
Evaluation of Bio-Based Earth Engineered Mortars for Low Energy and Carbon Buildings in Tropical and Subtropical Climates R.d.L.M. Paiva, L.R. Caldas, P.B. Souza, G.F. Oliveira and R.D. Toledo Filho	203
Physical, Thermal and Microstructural Characterization of Earth Mortars Stabilized with Incorporating Air Additive R.d.L.M. Paiva, P.B. Sousa, C.d.B.L. Carreira, A.P.S. Martins and R.D. Toledo Filho	211
First Step towards the Upscaling of the Production of Washing Fines - Hemp Composite. Study of Multiphysical Properties F. Collet, S. Khaled, S. Prétot and M. Bart	219
Mechanical Compression and Crushing Properties of a Straw-Lime Material P. Parmo, J. Hanus, N. Belayachi and P. Bailly	227
Erosion Behaviour of Bio-Stabilised Earthen Materials M. Audren, S. Guihéneuf, D. Rangeard and A. Perrot	234
Linseed Oil and Xanthan Gum: Promising Stabilisers for Earthen Building Materials S. Guihéneuf, A. Perrot and D. Rangeard	245
Bio-Stabilised Earthen Blocks: A Critical Study on Compression Tests of Immersed Samples S. Guihéneuf, A. Perrot, D. Rangeard and M. Cochetoux	255
Evaluation of a Marine Dredged Sediment as Raw Material Compared to Volcanic Scoria for the Development of Lime-Pozzolan Eco-Binders S. KOURTAA, M. Chabannes, F. Becquart and N.E. Abriak	263
Earth-Based Mortars: Mix Design, Mechanical Characterization and Environmental Performance Assessment R.d.L.M. Paiva, A.P.S. Martins, L.R. Caldas, O.A.M. Reales and R.D. Toledo Filho	271
How can a Climate-Neutral Building Look Like? O.B. Carcassi, G. Habert, L.E. Malighetti and F. Pittau	279
How Reliable is the Thermal Conductivity of Biobased Building Insulating Materials Measured with Hot Disk Device? T. Colinart, M. Pajeot, T. Vincelas, A. Hellouin de Ménibus and T. Lecompte	287
An Experimental Study on Clay and Sand Mixes to Develop a Non-Linear Homogenized Model for Earth Construction Materials E. Anglade, A. Sellier, J. Aubert and A. Papon	293
Research for Substantiation to Upscale Bio-Based Materials in the Construction Industry F. van der Burgh and S. Verspeek	303
Effect of Mix Proportions on Fresh and Rheological Properties of Cementitious Mixture Containing Natural Fibre: Modelling Using Factorial Design S. Kaushik, M. Sonebi, G. Amato, A. Perrot and U.K. Das	309
Mechanical Properties and Fracture Energy of Concrete Beams Reinforced with Basalt Fibres A.C. Da Costa Santos and P. Archbold	316
Experimental Investigation on the Fracture Energy and Mechanical Behaviour of Hemp and Flax Fibre FRC Compared to Polypropylene FRC A.C. Da Costa Santos and P. Archbold	326
Properties of <i>Phragmites australis</i> for Insulating Concrete Application M. Honoré, T. Lecompte and S. Pimbert	332
Self-Desiccation of a Vernacular CSA Binder N.P. Martins, B. Cicek, C. Brumaud and G. Habert	339
Experimental Out-of-Plane Behaviour of a Rammed Earth Sub-Assemblage Subjected to Seismic Inputs A. Romanazzi, D.V. Oliveira, R.A. Silva, P.X. Candeias, A.C. Costa and A. Carvalho	346
Customising Microstructural and Mineralogical Characteristics of Hydrated Lime Using Biopolymers C. Pesce, G. Pesce, M. Molinari and A. Richardson	353

Study of the Impact of Rice Straw Particle Size on the Mechanical and Thermal Properties of Straw Lime Concretes	
Y. El Moussi, L. Clerc and J. Benezet	361
Comparison of Numerical HMT Codes to Simulate MBV Test of Hemp-Earth Composites	
S. Khaled, M. Bart, S. Moissette, F. Collet, S. Prétot and B. Mazhoud	369
Water Stabilization of Clay Bricks with Improved Tannin and Iron Mixes	
Y. Du, C. Brumaud and G. Habert	377
Tackling Variability of Clay to Provide a Robust Binder	
D. Ardant, C. Brumaud and G. Habert	382
Microstructural Characterization of Prefabricated Hempcrete Blocks	
C. Moletti, V. Arosio and G. Dotelli	388
Reflections on the Environmental Impact of 'Vegetarian' Buildings, and on the Reliability of Databases	
A. Bocco and M. Bocci	395
Effect of Plant Fibres on the Variability of Cob Materials	
J. Tchiotso, N. Issaadi, P. Poullain and S. Bonnet	405
Improved Magnesium Cement for Durable Hemp Composite Boards	
J. Zorica, M. Sinka, G. Sahmenko and D. Bajare	413
Micro-Macro Modelling Approach of Vegetal Wools Thermal Conductivity	
C. Piégay, P. Glé, E. Gourlay, E. Gourdon and S. Marceau	421
Development of GHG Emissions Curves for Bio-Concretes Specification: Case Study for Bamboo, Rice Husk, and Wood Shavings Considering the Context of Different Countries	
L.R. Caldas, C.G. Bezerra, F. Pittau, A. Araujo, M. Franco, N. Hasparyk and R.D. Toledo Filho	428
Life Cycle Assessment of a Wall Made of Prefabricated Hempcrete Blocks	
V. Arosio, C. Moletti and G. Dotelli	436
Starch Reinforcement of Raw Earth Constructions	
J. Tourtelot, C. Fourdrin, J.B. d'Espinose de Lacaillerie, A. Bourguès and E. Keita	443
Successful Circular Bio-Based Construction Initiatives: Five Essentials from Case Studies	
M. Koster and I. Schrottenboer	448
Construction Field Monitoring of a COB Prototype Building	
A. Azil, M. Le Guern, K. Touati, M. Gomina, N. Sebaibi, M. Boutouil, F. Streiff, S. Goodhew and H. Louahlia	458
Earth Plastered Wall Heating as a Low-Emitting, Cost-Effective and Robust Energy System for Building Renovation	
A. Galimshina, M. Moustapha, A. Hollberg, G. Wagner, P. Padey, S. Lasvaux, B. Sudret and G. Habert	466
Substitution of Synthetic Fibers by Bio-Based Fibers in a Structural Mortar	
M. Audouin, N. Philippe, F. Bernardeau, M. Chaussy, S. Pons Ribera, P. Bredy Tuffe, A. Gasparutto, F. Chalencon, L. Bessette and P. Bono	472
Rheology, Mechanical Performance and Penetrability through Flax Nonwoven Fabrics of Lime Pastes	
A. Rakhsh Mahpour, M. Ardanuy, H. Ventura, J.R. Rosell and J. Claramunt	480
Effect of Viscosity Modifying Agent on the Performance of Hybrid Bio-Based Concrete	
M. Sonebi, P. Thiele, A. Abdalqader, L.I. Dvorkin, N. Lushnikova and J. Khatib	491
β-Cyclodextrin Substituted Polyoxyethylene in the Synthesis of Polycarboxylate Superplasticizers	
B. Li and L. Wang	499
Efficiency of Bio-Sourced Composites in Confining Recycled Aggregates Concrete	
E. Ghorbel and M. Limaiem	505
Recovery of Excavated Materials as an Alternative Solution to Earth Building Materials	
M. Nouali, M. Saillio and E. Ghorbel	513
Overcoming the Perceptual Gap: Worldwide Perceived Comfort Survey of Earthen Building Experts and Homeowners	
L. Ben-Alon, V. Loftness, K.A. Harries and E. Cochran Hameen	521
Biological Stabilisers in Earthen Construction: A Mechanistic Understanding of their Response to Water-Ingress	
Y. Kulshreshtha, P.J. Vardon, Y. Du, G. Habert, A. Vissac, J. Morel, S.M. Rao, L. van Paassen, M.C.M. van Loosdrecht, N.J.A. Mota and H.M. Jonkers	529

What Makes Cow-Dung Stabilised Earthen Block Water-Resistant Y. Kulshreshtha, P.J. Vardon, G. Meesters, M.C.M. van Loosdrecht, N.J.A. Mota and H.M. Jonkers	540
Influence of the Variability of Limestone and Fly Ash on the Setting and Mechanical Properties of a Moroccan Composite Cement N. El Fami, H. Agourrame, N. Khachani, A. Boukhari and A. Diouri	549
Effect of Immersion/Freezing/Drying Cycles on the Hygrothermal and Mechanical Behaviour of Hemp Concrete F. Benmahiddine and R. Belarbi	555
Interactions of Biobased Rheology Modifying Agents with Superplasticizer in Cement Paste A. Mezhev, K. Zhang and W. Schmidt	563
Contribution on the Use of Household Waste as Bio-Admixture I.A. Bella, N. Bella, A. Asroun and S. Saddiki	569
Traditional Gypsum Pavements with Natural Aditives B. González Sánchez, A. Navarro, J. Ramírez-Casas and J.R. Rosell	575
A Dual-Scale Numerical Model for the Diffusive Behaviour Prediction of Biocomposites Based on Randomly Oriented Fibres M. Nouri and M. Tahlaoui	584
Risk for Mould Growth on Hemp-Lime at Different Relative Humidity S. Johansson, K. Balksten and P.B. Strandberg-de Bruijn	588
Organic Brick G. Grassi, A. Erken and I. Paoletti	595
Plant Biomass Used for Green Concrete: A Review of Treatment Methods M. Chaussy, M. Chabannes, A. Day, D. Bulteel, F. Becquart and B. Laidoudi	601
Variability Assessment of the Compressive and Tensile Strength of Fibred Earthen Composites P. Poullain, M. Barnaure and S. Bonnet	612
Synthesis of the Current Knowledge Concerning the Construction of French Traditional Cob Building for Giving Recommendations S. Bonnet, D. Alzeort and P. Poullain	620
Hygrothermal Behaviour of Air Lime Coatings with Mussel Shell Sand C. Martínez-García, B. González-Fonteboa, D. Carro-López, F. Martínez-Abella and P. Faria	627
Evaluation of GHG Emissions from the Production of Cross-Laminated Timber (CLT): Analysis of Different Life Cycle Inventories L.R. Caldas, J. Sierra-Pérez, R.D. Toledo Filho and M. Silvano	635
Physical Properties and Hygrothermal Behavior of Mycelium-Based Composites as Foam-Like Wall Insulation Material F. Gauvin, V. Tsao, J. Vette and H.J.H. Brouwers	643
Mycelium Composites and their Biodegradability: An Exploration on the Disintegration of Mycelium-Based Materials in Soil A. Van Wylick, E. Elsacker, L.L. Yap, E. Peeters and L. de Laet	652
Performance of Alfa Fibres in Cementitious Materials Exposed to Diverse Surface Treatments S. Ajouguim, J. Page, C. Djelal, M. Waqif and L. Saadi	660
Stabilization of Dicalcium Silicate-Zn Composite Approaching Layered Double Hydroxide Structure for Bioactive Cement Applications H. Agourrame, A. Belafhaili, N. El Fami, N. Khachani, M. Alami Talbi, A. Boukhari and A. Diouri	668
Reed as a Thermal Insulation Material: Experimental Characterisation of the Physical and Thermal Properties R. Malheiro, A. Ansolin, C. Guarnier, J. Fernandes, L. Cosentino, S. Silva and R. Mateus	676
Investigation of Thermal, Mechanical and Acoustic Performance of Bio-Materials Based on Plaster-Gypsum and Cork S. Bouzit, F. Merli, M. Sonebi, S. Amziane, C. Buratti and M. Taha	685
Physico-Chemical Characterization of the Electric Arc Furnace Slag (EAFS) of the Sonasid-Jorf Steelworks - Morocco A. Hamama, M. Harrami, M. Saadi, A. Assani and A. Diouri	691

Hydro-Mechanics Coupling on Rammed Earth Material: Drying Experiment at Structural Scale	
T. Chitimbo, F. Abdul-Samad, N. Prime and O. Plé	698
Influence of Palm Oil Fibers Length Variation on Mechanical Properties of Reinforced Crude Bricks	
M. Hussain, D. Levacher, N. Leblanc, H. Zmamou, I.D. Maigre and A. Razakamanantsoa	707
Impact of Biobased Surfactants on Hygrothermal Behaviour of Gypsum Foams	
N. Mortada, A. Phelipot-Mardele and C. Lanos	715
Flexural Behavior of Six Species of Italian Bamboo	
S. Greco and L. Molari	723
Shear Behavior of Bamboo Reinforced Concrete Beams	
J. Khatib, A.H. Jahami, M. Sonebi and A. Elkordi	730
Improving Performance of Thermal Modified Wood against Termites with Bicine and Tricine	
D. Jones, L. Nunes and S. Duarte	735
3D Modelling of Hydric Transfers in Spruce Wood with Consideration of Sorption Hysteresis	
M. Maaroufi, K. Abahri, A. Bourdot and C. El Hachem	743
Development of Animal Fibres Composites for Construction Applications	
A. Alfocea-Roig, S. Huete-Hernandez, A. Maldonado-Alameda, J. Giro-Paloma, J.M. Chimenos-Ribera and J. Formosa-Mitjans	750
Use of Hemp Fibres in 3D Printed Concrete	
N.Z. van Hierden, F. Gauvin, S.S. Lucas, T.A.M. Salet and H.J.H. Brouwers	758
Effect of the Treatments of the Surface on Mechanical Performance of Concrete Containing Chemical Admixtures	
C. Campbell, G. Jackson, M. Sonebi and S. Taylor	766
Development of Airlaid Non-Woven Panels for Building's Thermal Insulation	
M. Ayadi, R. Zouari, C. Ségovia, A. Baffoun, S. Msahli and N. Brosse	772
Valorization of Vegetal Fibers in Anti-Fissuration Screed Mortar Formulation	
S. Pons Ribera, R. Hamzaoui, J. Colin, B. Vasseur, L. Bessette, F. Bernardeau, P. Bredy Tuffe, P. Bono, A. Gasparutto and M. Audouin	782
Fire Behavior of Raw Earth Bricks: Influence of Water Content and Cement Stabilization	
R.I. Abdallah, C. Perlot, H. Carré, C. La Borderie and H. El Ghoche	792
Link between Acoustic and Hygrothermal Behavior of Hemp Shiv and Pith Composites	
M.S. Abbas, A. Fabbri, M.Y. Ferroukhi, P. Glé, E. Gourdon and F. McGregor	801
Straw Material: End-of-Life Cycle Analysis Scenario	
N. Tornay, L. Floissac, C. Garcia, D. Rollet and C. Aventin	812
Influence of Fibre Treatment and Matrix Modification on Mechanical Properties of Flax Fibre Reinforced Mortars after Freeze/Thaw Cycles	
B. Poletanovic, K. Kopecko and I. Merta	817
Mortar to Repair Rammed-Earth Walls' Surfaces: Do we still Need it?	
H. Abuorfi and S. Wafi	825
Durability of Bamboo Bio-Concretes Exposed to Natural Aging	
V.M. Andreola, M.Y.R. da Gloria and R.D. Toledo Filho	834
Flax Fibers Composite Made up by 3D Printing	
C. Anwar, A. Benamara and A. Kaci	842
Experimental Investigation on Evaporation Rate for Enhancing Evaporative Cooling of Pervious Pavement Containing Recycled Rubber	
K. Seifeddine, E. Toussaint and S. Amziane	847
A Model for Assessment of Heat and Moisture Transfer Hollow a Hemp Concerte Wall Using Finite Element Method	
S. Ouldboukhite, S. Amziane and M. Benkhaled	855
Sensitivity Study on the Parameters of a Hygrothermal Transfer Model of Air, Heat and Mass Transfer	
S. Ouldboukhite, S. Amziane and M. Benkhaled	860
Compatibility of Plants with a Mineral Binder	
S. Marceau, L. Lacour, D. Diafi and F. Farcas	865
Bamboo Connection Technology for Lightweight Structures	
R. Aguilar Larrinaga, L. Haurie Ibarra, A.M. Lacasta Palacio and M. Tous Coll	872