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EDITORS:

Prof. Sofiane Amziane, Institut Pascal / UCA (Fr)

Dr. Mohammed Sonebi, Queen's University (UK)

Associate editor:

Dr. Karine Charlet, Institut Pascal / SIGMA (Fr)

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- prepare technical recommendations for testing methods,
- prepare state-of-the-art reports to identify further research needs,
- collaborate with national or international associations in realising these objectives.

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Preface

The ICBBM2017 is an international forum for information dissemination and exchange, discussions and debates on research and practice related to innovative bio-construction materials and technologies with objectives for sustainable development. To dynamically address these, and to capitalise real opportunities which they present for the future, Polytech-Clermont-Ferrand and Queen's University Belfast bring together leading building and civil engineering sector players and international experts, and other key stakeholders for what promises to be a landmark event in 2017's professional and business calendar. Working together in an international context is nowadays a basic condition for progress. The considerable developments and challenges in a rapidly changing world ask for grouping of forces and a common approach.

The conference attracted 250 people a wide range of academics, scientists, researchers, students, designers, policy makers and other industrialists from a wide variety of backgrounds, including fields of engineering, materials, sustainable, architecture, and ecological technologies, biomaterials, materials sciences, environmental engineering and government agencies, end-users, etc. Participants have the opportunity to share ideas on the state-of-the-art innovations, state-of-the-practice and future trends of bio-based building materials and sustainable materials used in construction.

The ICBBM2017 proceedings include the lectures and papers presented at ICBBM2017 conference. It consists of a book of full texts of papers: 7 plenary papers and 130 papers from over 40 countries. The plenary keynotes and papers cover the wide spectrum of the topics related to Natural fibres and materials, Mechanical performances of bio-based building materials and design properties, Hygroscopic and hygrothermal properties of biomaterials, Acoustic and durability performance of bio-materials, sustainability of bio-based materials, Eco-friendly binders with low CO₂-emission and Low embodied carbon energy, Advances in research methodologies and Bio-materials testing, modeling building materials Rammed earth, Life-cycle assessment of materials, and others.

On behalf of the Local Organizing Committee of ICBBM2017, we would like to take this opportunity to express our sincere thanks to all our contributors and participants for their carefully prepared, stimulating and thought provoking manuscripts; to the organizers of workshop for their dedicated task; to the members of the Technical and Scientific Committee for their time and effort of reviewing the papers and their valuable assistance, without which the conference could not be formed.

The organization of a conference of this scale could not have been possible without the support and contributions of many organizations and individuals. This conference would not have been possible without the financial support given by the numerous sponsors (14 industrial sponsors, 5 institutions and 3 technical associations). We also value the support of RILEM organization (The International Union of Laboratories and Experts in Construction Materials, Systems and Structures) and American Concrete Institute (ACI).

Thanks go to all those who have devoted their time and effort to the organization of the conference and publication of the proceedings, including secretarial staffs and research students of the ICBBM2017.

Plenary speakers

Vegetal concrete: sustainability, design, properties, durability and future R&D trends

Prof. Sofiane Amziane

Sofiane Amziane is a full Professor of University of Clermont Auvergne since 2008 and he is the coordinator of materials Innovation Research Team of the Institut Pascal – UMR 6602 which is a part of CNRS. His main area of interest is turned since 2008 on bio based building materials, rheology of cement based material and reparation of RC structure with composite. He was the supervisor (or co-supervisor) of 17 concluded doctorates and published more than 60 full papers. He edited the first book related to Bio-aggregate-based Building Materials: Applications to Hemp Concretes as STAR of RILEM books and NIST report. He is member, chair or co-chair of several ACI and RILEM committees.

Dr. Mohammed Sonebi

Dr Mohammed Sonebi graduated from the University of Sherbrooke (Canada) with a PhD and MSc in Civil Engineering after completing a MEng degree at Bridges, Pavement and Structural buildings. He then joined University of Paisley (Scotland) as a postdoctoral research assistant and later as a Lecturer. He is now a Senior Lecturer at Queen's University Belfast. He has authored/co-authored more than 170 scientific papers and 17 books/chapters. He is a Senior Member of RILEM and Chair of RILEM-TC-266 and Voting member of American Concrete Institute (ACI) and Vice-Chair of ACI 522. He awarded the Best KTP Partnership and Excellence Engineering Awards 2013, a Finalist for Parliamentary Awards 2016 in category Innovation Leading to New Markets at Westminster (UK) with Bullivant Taranto Ltd..

Challenges and opportunities of using alternative construction materials in the global housing sector – Environmental perspectives

Dr. Guillaume Habert

Guillaume Habert is since 2012 Associate Professor and hold the chair of Sustainable construction at ETH Zurich. The main objectives of the research are to identify the relevant parameters that influence the environmental impacts of buildings and infrastructures, to quantify the improvement potentials for specific materials and structures and develop innovative constructive techniques adapted to the technical, economic and socio-cultural situation of specific territories. This involves interdisciplinary works dealing among others with Life Cycle Assessment, urban metabolism and material science. The current projects involve the development of clay based concrete, the use of excavation materials and the sustainability assessment of low carbon cement.

Discrete modelling of building materials

Prof. Farhang Radjaï

Farhang Radjai is Research Director at National Center for Scientific Research (CNRS) in France. He is the head of research team « Physics and Mechanics of Discrete Materials » at the Laboratory of Mechanics and Civil Engineering (LMGC) in University of Montpellier and MIT research affiliate at the CNRS-MIT research group « Multi-Scale Material Science for Energy and Environment ». He graduated in 1995 in theoretical physics and received his PhD on modeling granular materials in University Paris-Sud. His research has mainly focused on the rheology of granular materials using discrete modeling approaches and statistical analysis with applications to cohesive flows, underwater avalanche dynamics, multi-phase granular materials, agglomeration process, powder compaction and railway ballast settlement.

Innovations in the use of bio-based aggregates in construction

Dr Mike Lawrence

After careers in accountancy, book-selling and stone quarrying, Mike Lawrence became a Lecturer in low-carbon design in 2012 in the BRE Centre for Innovative Construction Materials at the University of Bath. He specialises in Natural Building Materials and in the optimisation of the fabric of buildings to minimise in-use energy consumption. He founded the Building Research Park and the experimental HIVE building in 2013. Mike is Principal Investigator for the EU funded HEMPSEC and ISOBIO projects and co-investigator on the ECO-SEE project and has published over 60 peer reviewed papers. He also worked with Bath Abbey on their Footprint Project to ensure that the proposed work has no impact on the historic fabric of the Abbey. Mike is a Trustee and Director of Earth Building UK Ltd, a charity dedicated to promoting the use of earth in construction in the UK and has been a member of two RILEM committees (TC BBM and Hygrothermal and Durability of BBM).

*Advances in laboratory characterization of materials***Prof. B. Caicedo**

Bernardo Caicedo is graduate in Civil Engineering at the Cauca University in Colombia (1986), DEA in geotechnics and structures, Ecole Centrale de Paris (1987), PhD in Geotechnics and Structures Ecole Centrale de Paris (1991). He is now Professor at Los Andes University since 1991. His main research topics are: physical modelling in geotechnics, unsaturated soil mechanics, and experimental geotechnics. Prof. Caicedo is member of the editorial board of Geotechnique Letters, Acta Geotechnica and the Journal of Transportation Geotechnics. He is also referee for several international journals, supervisor of 95 master thesis, 12 doctoral thesis in Uniandes. He is the leader of more than 65 research projects in pavements and geotechnics in Uniandes. He is the editor of one book and author of 80 conference papers and 36 journal papers.

*Non-conventional inorganic-bonded fiber composite materials for housing and infrastructure application***Prof. H. Savastano**

Holmer Savastano Junior got his doctor degree in the field of civil construction (USP, Brazil, 1992). He has a post doctorate in the CSIRO, Australia (1998-99) and extensive collaboration with international research groups and with the industry since 2001. Holmer coordinates the Research Nucleus on Materials for Biosystems, USP since 2012. He has published about 140 full scientific papers with more than 1,200 citations (Web of Science). His main interest is on composite materials, use of residual and non-conventional resources, sustainable and eco-friendly housing and infrastructure.

*Concrete recycling: a new paradigm to face the challenge of circular economy***Dr F. de Larrard**

François de Larrard, PhD, is graduated from Ecole Polytechnique and Ecole Nationale des Ponts et Chaussées, Paris, France. He started his career at LCPC (now IFSTTAR), doing R&D in the field of concrete for bridges and pavement, with an emphasis on mix-design optimisation, fresh concrete rheology, high-performance concrete, innovative pavement concepts and sustainability. He joined the Lafarge group in 2011, where he holds a position of Scientific Director. François de Larrard has authored numerous papers, books, software programs and laboratory devices. In addition to his LafargeHolcim position, François is currently Scientific Director of the French national project Recybéton, a 44-partner group aiming at developing the process of recycling concrete into concrete in France.