

VIRTUAL MEETING PROGRAM

11TH ADVANCES IN CEMENT-BASED MATERIALS

June 23–25, 2021

ceramics.org/cements2021

Organized by:
The Cements Division of



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11TH ADVANCES IN CEMENT-BASED MATERIALS

DELLA ROY LECTURE

Wednesday, June 23 | 3:30 – 4:30 pm

Professor R. Douglas Hooton, University of Toronto

Title: *Porosity and Transport Properties in Cementitious Materials: How Experimental Details Complicate Measurement and Analysis*



Professor R. Douglas Hooton is the NSERC/CAC Industrial Research Chair in Concrete Durability and Sustainability. His research involves finding ways to reduce the greenhouse gas emissions associated with concrete infrastructure. He investigates the use of materials such as supplementary cementitious materials and ground limestone to produce a stronger and more durable concrete product. His research has informed the specification codes associated with the American Concrete Institute, the Canadian Standards Association and ASTM standards.

POSTER SESSION

Thursday, June 24, 2021

1:30 – 3:30 pm

For complete poster listings see pg 7

PROGRAM CHAIRS

Wil Srubar, University of Colorado, Boulder

Denise A. Silva, Custom Building Products

Jeffrey Thomas, GCP Applied Technologies

Dimitri Feys, Missouri University of Science and Technology

Shiho Kawashima, Columbia University

SCHEDULE OF EVENTS

WEDNESDAY, JUNE 23

Welcome	9:30 – 9:45 am
Keynote speaker, Q&A (Randolph Kirchain)	9:45 – 10:30 am
Coffee-break	10:30 – 10:50 am
Breakout session	10:50 am – 12:10 pm
Lunch break (Networking)	12:10 – 1:00 pm
Breakout session	1:00 – 3:00 pm
Coffee break	3:00 – 3:15 pm
Della Roy Tribute	3:15 – 3:30 pm
Della Roy Lecture, Q&A	3:30 – 4:30 pm
Business meeting	4:30 – 5:00 pm
Networking (stay on same Zoom link)	5:00 – 5:45 pm

THURSDAY, JUNE 24

Keynote speaker, Q&A (Helen Murphy)	9:30 – 10:15 am
Coffee break	10:15 – 10:30 am
Breakout session	10:30 am – 12:30 pm
Lunch break (Networking)	12:30 – 1:30 pm
Poster session	1:30 – 3:30 pm
Coffee break	3:30 – 3:45 pm
Breakout session Rooms	3:45 – 5:45 pm

FRIDAY, JUNE 25

Breakout session	9:30 – 10:50 am
Coffee-break	10:50 – 11:10 am
Breakout session	11:10 am – 12:30 pm
Lunch break (Networking)	12:30 – 1:30 pm
Breakout session	1:30 – 3:50 pm
Poster award & closing ceremonies	4:00 – 4:15 pm

CONFERENCE SCHEDULE

DAY 1 – JUNE 23 (Wednesday)

9:45 – 10:30 am

Moderator: Jeff Thomas

Keynote speaker, Q&A:

RANDOLPH KIRCHAIN

Concrete Sustainability Hub,
Massachusetts Institute
of Technology

*"The role of concrete in life cycle
greenhouse gas emission
reductions of United States
buildings and pavements"*

BREAKOUT SESSION 1A

CO₂ EMISSIONS REDUCTION IN THE CEMENT INDUSTRY

Moderator: Maria Juenger

Time	Description
10:50 – 11:10 am	<i>Machine learning-aided concrete design for optimal engineering performance and CO₂ emissions</i> Yu Song* , Boya Ouyang, Gaurav Sant, and Mathieu Bauchy
11:10 – 11:30 am	<i>Machine learning-based rapid fly ash screening for greener concrete production</i> Yu Song* , Gaurav Sant, and Mathieu Bauchy
11:30 – 11:50 am	<i>Retardation mechanisms of algae on cement hydration</i> Xu Chen* , Mohammad Matar, Danielle Beatty, and Wil V. Srubar III
11:50 am – 12:10 pm	<i>Combined effects of slag and CO₂ curing on mechanical and transport properties of concrete</i> Hosain Haddad Kolour* and Eric N. Landis

BREAKOUT SESSION 1B

MATERIALS CHARACTERIZATION TECHNIQUES

Moderator: Kyle Riding

Time	Description
10:50 – 11:10 am	<i>Initiation of chloride-induced corrosion of low carbon steel rebar in concrete using in-situ quantitative phase microscopy</i> Ebenezer Fanijo* and Alexander S. Brand
11:10 – 11:30 am	<i>Raman imaging: A new technique for old problems</i> Nishant Garg*
11:30 – 11:50 am	<i>The effect of vibration on the mixing process, fresh state properties and hardened performance of different concrete</i> Kaiyin Zhao* , Lijun Zhao, Raissa Ferron, and Zhaongxu Feng
11:50 am – 12:10 pm	<i>The use of isothermal calorimetry to model heat evolution of cementitious mixes under adiabatic conditions</i> Luna Al Hasani* , Greisi Perez, Jason Brown, Russell Gentry, and Kimberly E. Kurtis



CONFERENCE SCHEDULE

DAY 1 – JUNE 23 (Wednesday)

3:15 – 3:30 pm

Della Roy Tribute
Moderator: Kim Kurtis

MICHAEL GRUTZECK

The Pennsylvania State
University

3:30 – 4:30 pm

Della Roy Lecture, Q&A
Moderator: Kim Kurtis

R. DOUGLAS HOOTON

University of Toronto

*“Porosity and Transport
Properties in Cementitious
Materials: How Experimental
Details Complicate
Measurement and Analysis”*

BREAKOUT SESSION 2A

SUPPLEMENTARY AND ALTERNATIVE CEMENTITIOUS MATERIALS I

Moderator: Jeff Thomas

Time	Description
1:00 – 1:20 pm	<i>Influences of fineness and amorphous content on supplementary cementitious materials reactivity</i> Sivakumar Ramanathan* , Priyadharshini Perumal, Montale Tuen, Mirja Illikainen, and Prannoy Suraneni
1:20 – 1:40 pm	<i>Strength activity index and bulk resistivity index variants that differentiate inert and reactive materials</i> Ying Wang* , Christopher R. Shearer, Robert Douglas Hooton, Prannoy Suraneni, and Lisa E Burris
1:40 – 2:00 pm	<i>Using the dissolution kinetics of fly ashes to predict the pozzolanic reactivities</i> Yujia Min* and Lisa E Burris
2:00 – 2:20 pm	<i>Evaluating pozzolanicity with time-series surface resistivity measurements</i> Renee Rios* and Kimberly E. Kurtis
2:20 – 2:40 pm	<i>Comparative study of mechanical vs thermal activation for a UK lateritic soil</i> Alastair Marsh* , Maria Juenger, and Susan A. Bernal
2:40 – 3:00 pm	<i>The importance of interfacial chemistry on the strength of slowly-reacting fly ash-cement composites</i> Mehdi Shishehbor* , Daisuke Sakaniwa, Damian Stefaniuk, Konrad J Krakowiak, and MJ Abdolhosseini



BREAKOUT SESSION 2B

NANOTECHNOLOGY IN CEMENTITIOUS MATERIALS

Moderator: Nishant Garg

Time	Description
1:00 – 1:20 pm	<i>Quantitative analysis of mwcnts effects on the microstructure and mechanical properties of the potassium-based metakaolin geopolymers using grid nanoindentation</i> Jiaxin Chen* and Ange-Therese Akono
1:20 – 1:40 pm	<i>Hydration, rheology and mechanical properties of nanomaterial-coated cements produced via dry dispersion</i> Ala Eddin Douba* and Shiho Kawashima
1:40 – 2:00 pm	<i>Effect of structural variables and surface functionalization of highly dispersed CNTs and CNFs on the semiconducting behavior of nano-engineered concrete</i> Michail Margas* , Panagiotis Danoglidis, Efstathios Meletis, and Maria S. Konsta-Gdoutos
2:00 – 2:20 pm	<i>Quantitative characterization of the degree of dispersion of CNTs in percolative cementitious nanocomposites</i> Panagiotis Danoglidis* , Maria S. Konsta-Gdoutos, and Surendra Shah
2:20 – 2:40 pm	<i>Potential for industrialization of belite nanoparticles manufactured by aerosol pyrolysis compared to other synthesis methods</i> Daniel Gil-Velasquez* , Juan José Perez, Jorge Iván Tobón, Oscar Jaime Restrepo, and Natalia Betancur-Granados
2:40 – 3:00 pm	<i>Cementitious materials modified by iron-based nanoparticles for radioactive waste immobilization</i> Mo Li* ¹ , Shuai Fan, Bo Cao, Ning Deng, and Yandi Hu



9:30 – 10:15 am

Keynote speaker, Q&A
Moderator: Denise Silva

HELEN MURPHY

GCCA/Innovandi

“Towards Carbon Neutral
Concrete”

BREAKOUT SESSION 3A

SUPPLEMENTARY AND ALTERNATIVE CEMENTITIOUS MATERIALS II

Moderator: Denise Silva

Time	Description
10:30 – 10:50 am	<i>Digital foam index test for fly ash concrete</i> Aniruddha Baral* and Jeffery Roesler
10:50 – 11:10 am	<i>Study of metakaolins with different amorphities and particle sizes activated by KOH and K_2SiO_3</i> Dayana Keitty Carmo Gonçalves* , Sebastiana Luiza Bragança Lana, Rosemary Bom Conselho Sales, and Maria Teresa Paulino Aguilar
11:10 – 11:30 am	<i>Chemical and autogenous deformations in metakaolin based alkali activated materials</i> Francesca Lolli* , Jeffrey J Thomas, Fabio Cucinotta, Kimberly E. Kurtis, and Enrico Masoero
11:30 – 11:50 am	<i>Effects of MgO on the microstructure and mechanical performance of carbonated wollastonite composites</i> Rakibul Khan* and Warda Ashraf
11:50 am – 12:10 pm	<i>Synergistic effects of air content and supplementary cementitious materials in reducing calcium oxychloride damage in concrete</i> Nima Hosseinzadeh* , and Prannoy Suraneni

BREAKOUT SESSION 3B

SMART MATERIALS AND SENSORS & COMPUTATIONAL MATERIALS SCIENCE

Moderator: Nishant Garg

Time	Description
10:30 – 10:50 am	<i>Electrical-to-thermal energy conversion efficiency of nano and micro scale carbon fiber reinforced semiconductor concrete</i> Maria Konsta-Gdoutos* , Panagiotis Danoglidis, and Myrsini Maglogianni
10:50 – 11:10 am	<i>Smart cement-based materials enabled by their dielectric behavior</i> Deborah Chung* and Xiang Xi
11:10 – 11:30 am	<i>Determination of influential parameters on concrete fracture using peridynamics</i> Christa Torrence* , Reese Jones, Jeremy Trageser and Jessica M Rimsza
11:30 – 11:50 am	<i>Atomistic modeling of cross-linked hybrid organic inorganic cementitious materials</i> Ali Morshedifard* , MJ Abdolhosseini, Konrad J Krakowiak and Amir Moshiri
11:50 am – 12:10 pm	<i>The role of topological disorder in the dissolution kinetics of supplementary cementitious materials</i> Luis A Ruiz Pestana* , Prannoy Suraneni and Swathi Shantharaju
12:10 – 12:30 pm	<i>Composition-structure-reactivity relationship for highly complex volcanic ashes: Molecular dynamic simulations</i> Kai Gong* and Elsa Olivetti



JUNE 24 (THURSDAY)

POSTER SESSION

POSTERS Session A

1:30 – 2:30 pm

Early-age properties of alkali-activated metakaolin-based geopolymers

Abu Naser Reza, South Dakota School of Mines and Technology

Performance of OPC blended with municipal solid waste incineration (MSWI) ashes

Vikram Kumar, University of Illinois at Urbana-Champaign

Durability and pore structure of zeolite-based cementitious materials

Md Shariful Islam, Tennessee Technological University

Performance of limestone calcined clay cement at elevated temperature

Farzana Rahman, University of Texas at Austin

The influence of supplementary cementitious material stabilizers on compressed earth block performance

André Fuqua, University of Texas at Austin

Direct sub-nanoscale observations of magnesium carbonate precipitation on magnesium oxide surfaces

Ian Shortt, University of Texas at Arlington

Investigation of the kinetics of magnesium silicate hydrate precipitation using atomic force microscopy

Dylan Singh, University of Texas at Arlington

POSTERS Session B

2:30 – 3:30 pm

Effects on flow and strength of mix design adjustments for mortar internally cured with superabsorbent polymers

Caitlin Adams, Purdue University

Atomistic thermodynamics and kinetics of belite dissolution

Yong Tao, University of California, Irvine

Time dependent rheological behavior of type I-II portland cement-paste – a comparative study

Babajide Onanuga, Tennessee Technological University

Effect of vibration on rheology of concrete for 3D printing

Karthik Pattaje, University of Illinois at Urbana-Champaign

Enhanced freeze-thaw resistance in cement paste via biomimetic ice recrystallization inhibition activity of polyvinyl alcohol

Shane Frazier, University of Colorado Boulder

Can a bioinspired mimic of antifreeze proteins inhibit freeze-thaw damage in cement paste?

Aparna Lobo, University of Colorado Boulder

High-resolution phase mapping of granite via a novel raman imaging protocol

Krishna Polavaram, University of Illinois at Urbana-Champaign

Evaluation of adsorption tracking methods for unconventional and marginal fly ash

Erin Stewartson, The Ohio State University

BREAKOUT SESSION 4A

SUPPLEMENTARY AND ALTERNATIVE CEMENTITIOUS MATERIALS III

Moderator: Prannoy Suraneni

Time	Description
3:45 – 4:05 pm	<i>Durability evaluation of impounded class c fly ash as a supplementary cementitious materials</i> Anfal Alaibani*
4:05 – 4:25 pm	<i>Top-down synthesis of nano zeolite a as seeding agent in alkali-activated binders</i> Yige Zhang* , Christine Ann Pu and Claire E. White
4:25 – 4:45 pm	<i>Mechanical and durability performance of recreated roman concrete containing calcined clay minerals</i> Mohammad Jaberizadeh* , Ishrat Baki Bor-no, Warda Ashraf and Surendra Shah
4:45 – 5:05 pm	<i>Heat of reaction and set time relationship in geopolymers made of three pozzolans</i> Sepideh Akhbarifar* , Weiliang Gon-ga, Werner Lutze and Ian L. Pegg
5:05 – 5:25 pm	<i>Reactivity of calcined impure clays</i> Katelyn O’Quinn* and Maria Juenger
5:25 – 5:45 pm	<i>Influence of chemical admixtures on the hydration of calcium aluminate cement/gypsum systems</i> Denise Silva*

BREAKOUT SESSION 4B

CEMENT CHEMISTRY, PROCESSING AND HYDRATION I

Moderator: Jeff Bullard

Time	Description
3:45 – 4:05 pm	<i>Calculation of growth rate of calcium silicate hydrate on mineral surfaces using flow reactor</i> Tunahan Aytas* , Brian Traynor, Spencer Hu and Elsa Olivetti
4:05 – 4:25 pm	<i>Mechanism of formation of dicalcium silicates synthesized by flame spray pyrolysis (FSP)</i> Natalia Betancur-Granados* , Oscar Jaime Restrepo and Jorge Iván Tobón
4:25 – 4:45 pm	<i>Retarding mechanism of sucrose and zinc hydroxide on cement hydration based on topochemical reaction</i> Deyu Kong* , David Corr, Yang Yang, Surendra Shah and Sitao Xue
4:45 – 5:05 pm	<i>Effect of silica-containing superabsorbent polymers on the hydration and microstructural properties of internally cured cement paste</i> Baishakhi Bose* and Kendra A. Erk
5:05 – 5:25 pm	<i>Air voids induced by the post-curing drying of cement paste</i> Deborah Chung* and Xiang Xi



BREAKOUT SESSION 5A

ADVANCES IN RHEOLOGY

Moderator: David Lange

Time	Description
9:30 – 9:50 am	<i>Predicting the rheology of limestone calcined clay cement (LC3)</i> Ogulcan Canbek* , and Kimberly E. Kurtis
9:50 – 10:10 am	<i>How shearing can cause an increase in rheological properties of fresh cement pastes</i> Aida Margarita Ley-Hernandez and Dimitri Feys*
10:10 – 10:30 am	<i>The use of rheology to characterize air dissolution of fresh cement pastes under dynamic conditions</i> Daniel Galvez Moreno, Kyle Austin Riding, and Dimitri Feys*
10:30 – 10:50 am	<i>Characterizing behavior of cement slurries with high-volume iron particles under low magnetic field strengths</i> Lyn Zemberecki* , Ryan Schanta and Sriramya D Nair

BREAKOUT SESSION 5B

CEMENT CHEMISTRY, PROCESSING AND HYDRATION II

Moderator: Tyler Ley

Time	Description
9:30 – 9:50 am	<i>Mechanism of hydration of belite nanoparticles made from flame spray pyrolysis</i> Juan José Perez* , Daniel B Gil-Velasquez, Jorge Iván Tobón, Oscar Jaime Restrepo, and Natalia Betancur-Granados
9:50 – 10:10 am	<i>SpH-dependent chloride desorption isotherms of portland cement paste</i> Mahmoud Shakouri, and Mohammad Teymouri*
10:10 – 10:30 am	<i>Using electrical resistivity to make real time measurements of degree of saturation and tensile strength of early hydration</i> Lichun Chen* , and Tyler Ley
10:30 – 10:50 am	<i>Mechanical properties of thermally and mechanically accelerated aged concrete</i> Sannidhya K Ghosh* , Petros Sideris and Mija Hubler



BREAKOUT SESSION 6A

ADDITIVE MANUFACTURING USING CEMENTITIOUS MATERIALS I

Moderator: Dimitri Feys

Time	Description
11:10 – 11:30 am	<i>A bio-inspired structural design for enhancing the damage resistance of cement-based materials</i> Hadi Esmaeeli* , Reza Moini, Alejandro Alcaraz, Jeffrey Youngblood, Jan Olek, Jason Weiss and Pablo D. Zavattieri
11:30 – 11:50 am	<i>Improving buildability of limestone calcined clay-based cementitious materials by incorporating nanoclay</i> Xiangyu Wang* , Veronica Deogratius Wambura, Dana Ashmawy, Inderjeet Singh, and Kemal Celik
11:50 am– 12:10 pm	<i>Computational printing of rheological changes with setting time of cement-based pastes in 2D geometry</i> Abdul Salam Mohammad* and Joseph Biernacki
12:10 – 12:30 pm	<i>Two-phase smart polymeric admixture for manipulating static yield stress and apparent viscosity in cement paste</i> Anastasia Aday* , Mohammad Matar and Wil V. Srubar III

BREAKOUT SESSION 6B

DURABILITY AND SERVICE-LIFE MODELING

Moderator: Wil Srubar

Time	Description
11:10 – 11:30 am	<i>Mix design strategies for reduced shrinkage cracking in bridge decks</i> Christopher Shearer* , and Eric Simonton
11:30 – 11:50 am	<i>Prediction of remaining service life of pre-stressed concrete girders with cracks</i> Savitha Srinivasan* , and Raissa Ferron
11:50 am – 12:10 pm	<i>Using a medical x-ray equipment to measure diffusion within concrete</i> Tyler Ley*
12:10 – 12:30 pm	<i>Revisiting the relationship between concrete resistivity and corrosion rate of steel</i> Zushi Tian and Hailong Ye*



4:00 – 4:15 pm
Poster Award &
Closing Ceremony

THANK YOU ALL!

BREAKOUT SESSION 7A

ADDITIVE MANUFACTURING USING CEMENTITIOUS MATERIALS II

Moderator: Dimitri Feys

Time	Description
1:30 – 1:50 pm	<i>Neutron scattering and rheology of microstructure evolution during cement hydration for additive A84:H128</i> Andrew Allen* , Scott Jones, and Julie B Hipp
1:50 – 2:10 pm	<i>Hydrogel-forming polymers as printing aids for cementitious materials</i> Hajar Taheri Afarani* , Edward J Garboczi, and Joseph Biernacki
2:10 – 2:30 pm	<i>A grid nanoindentation and SEM/ eds study on the micromechanical properties of extrusion-based 3D printed cement paste</i> Michael Kosson* ; Lesa Brown, and Florence Sanchez
2:30 – 2:50 pm	<i>Optimizing the fresh properties of 3D printing concrete from a numerical simulation approach</i> Chuanyue Shen* , and David Lange
2:50 – 3:10 pm	<i>Stability of air-void system in 3D printed concrete</i> Arnesh Das* , Yu Song, Sara Mantellato, Timothy Wangler, and Robert J. Flatt
3:10 – 3:30 pm	<i>Set on demand low clinker mortar for 3D printing</i> Federica Boscaro* , Elia Quadranti, Timothy Wangler, Sara Mantellato, Lex Reiter, and Robert J. Flatt

BREAKOUT SESSION 7B

BIO-INSPIRED CEMENTITIOUS MATERIALS

Moderator: Wil Srubar

Time	Description
1:30 – 1:50 pm	<i>A bio-inspired approach towards self-healing of cementitious materials</i> Elvis Baffoe* and Ali Ghahremaninezhad
1:50 – 2:10 pm	<i>Mimicking nature's antifreeze can inhibit freeze-thaw damage in cement paste and concrete</i> Mohammad Matar* , Shane D. Frazier, Jorge Osio-Norgaard, Anastasia N. Aday, Elizabeth A. Delesky and Wil V. Srubar III
2:10 – 2:30 pm	<i>Toward biogenic production of supplementary cementitious materials using photosynthesis</i> Sarah Williams* , Danielle Beatty, and Wil V. Srubar III
2:30 – 2:50 pm	<i>A comparative analysis on the effects of cellulose nanomaterials from different sources on the performance of cement paste</i> Muhammad Intesarul Haque* and Warda Ashraf
2:50 – 3:10 pm	<i>Development of non-axenic bacterial strains for use in concrete</i> Cansu Acarturk* , Judith Straathof, Natalie Hull, and Lisa E Burris
3:10 – 3:30 pm	<i>The optimum acid pretreatment method of corn stover for applications as supplementary cementitious materials</i> Mahmoud Shakouri, and Mohammad Teymouri*
3:30 – 3:50 pm	<i>Hydration of alite in presence of a bio-inspired strength enhancer</i> Yi Fang and Jialai Wang*

