

PROGRAM

13TH ADVANCES IN CEMENT-BASED MATERIALS

June 14–16, 2023 | Columbia University, New York, NY

Organized by:
The Cements Division of



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13TH ADVANCES IN CEMENT-BASED MATERIALS

DELLA ROY LECTURE

THURSDAY, JUNE 15 | 4 – 5 p.m.

Davis Auditorium



Title: *Hindsight, Foresight, and Insight: Calorimetry and Chemical Shrinkage through the Years*

Della Roy Lecturer:
Dale P. Bentz (National Institute of Standards and Technology)

For full biography and abstract see pg 16.

DELLA ROY RECEPTION / POSTER SESSION

Thursday, June 15, 2023

5 – 7 pm

Carleton Commons

For complete poster listings see pg 18

ACerS 2023 LOCAL AND TECHNICAL CO-CHAIRS

Shiho Kawashima, Columbia University

Dimitri Feys, Missouri S&T, Chair of ACerS Cements Division

CARLETON COMMONS:

S.W. Mudd Building, 500 West 120th Street, New York, NY 10027 (Campus Level Entrance / 4th Floor)

DAVIS AUDITORIUM AND 750 CEPsR:

Schapiro CEPsR, 530 West 120th Street, New York, NY 10027

See campus map on pg 16

SCHEDULE OF EVENTS

TUESDAY, JUNE 13

Students and Young Professionals Networking Event: Academic Career Panel + Dinosaur BBQ (Columbia Innovation Hub - 2276 12th Ave, New York, NY 10027) RSVP required 5 - 8 p.m.

WEDNESDAY JUNE 14

Registration & Coffee (Carleton Commons) 7:30 - 8:15 a.m.
Opening Remarks (Davis Auditorium) 8:15 - 8:30 a.m.
Keynote #1 - Elise Berodier, Freyssinet Switzerland (Davis Auditorium) 8:30 - 9:15 a.m.
Breakout Session 1a and 1b (2h) 9:35 - 11:35 a.m.
1a Sustainability through Supplementary and Alternative Cementitious Materials (Part 1 of 2)
1b Bio-inspired cementitious materials
Lunch 11:35 a.m. - 1:30 p.m.
Breakout Session 2a and 2b (1h30m) 1:30 - 3 p.m.
2a Materials Characterization Techniques
2b Nanotechnology in Cementitious Materials
Breakout Session 3a and 3b (1h30m) 3:20 - 4:50 p.m.
3a CO₂ Utilization towards Carbon Neutral Concrete
3b Computational and Data Driven Materials Science

THURSDAY, JUNE 15

Registration & Coffee (Carleton Commons) 8 - 8:30 a.m.
Keynote #2 - Prannoy Suraneni, University of Miami (Davis Auditorium) 8:30 - 9:15 a.m.
Breakout Session 4a and 4b (2h) 9:35 - 11:35 a.m.
4a Sustainability through Supplementary and Alternative Cementitious Materials (Part 2 of 2)
4b Durability and service-life modeling
Lunch 11:30 a.m. - 1:00 p.m.
Breakout Session 5a and 5b (1h30m) 1 - 2:30 p.m.
5a Cement Chemistry (Part 1 of 2)
5b Additive Manufacturing and Rheology of Cementitious Materials (Part 1 of 2)
NSF Program Director Q&A - Gianluca Cusatis (Davis Auditorium) 2:50 - 3:30 p.m.
Business Meeting (Davis Auditorium) 3:30 - 4 p.m.
Della Roy Lecture - Dale Bentz (Davis Auditorium) 4 - 5 p.m.
Della Roy Reception / Poster Session (Carleton Commons) 5 - 7 p.m.

FRIDAY, JUNE 16

Registration & Coffee (Carleton Commons) 8 - 8:30 a.m.
Industry Talks - Scott Schneider (Thornton Tomasetti), Matt D'Ambrosia (MJ2 Consulting), George Perry (Black Buffalo 3D) (Davis Auditorium) 8:30 - 9:30 a.m.
Breakout Session 6a and 6b (1h30m) 9:50 - 11:20 a.m.
6a Cement Chemistry (Part 2 of 2) 11:40 a.m. - 12 p.m.
6b Additive Manufacturing and Rheology of Cementitious Materials (Part 2 of 2)
Awards and closing (Davis Auditorium)

CONFERENCE SCHEDULE

DAY 1 – WEDNESDAY– JUNE 14

BREAKOUT SESSION 1A | 9:35 - 11:35 A.M. | DAVIS AUDITORIUM

SUSTAINABILITY THROUGH SUPPLEMENTARY AND ALTERNATIVE CEMENTITIOUS MATERIALS (PART 1 OF 2)

Moderator: Nishant Garg

Time	Description
9:35 – 9:50 a.m.	<p><i>Assessing the carbonation performance of blended cement with natural supplementary cementitious materials</i></p> <p>Katelyn O’Quinn¹; Susan A. Bernal², and Maria Juenger^{*1}, (1) University of Texas at Austin, Austin, TX, (2) University of Leeds, Leeds, United Kingdom</p>
9:50 – 10:05 a.m.	<p><i>Interpreting the hydration kinetics and performance of fly ash-containing cementitious binders</i></p> <p>Rohan R Bhat[*]; Taihao Han; Sai Akshay Ponduru and Aditya Kumar, Missouri University of Science and Technology, Rolla, MO</p>
10:05 – 10:20 a.m.	<p><i>Quarry by-products as a mineral filler: Effect on cement hydration</i></p> <p>Alexander S. Brand[*]; Michael D. Lowry; Tu-Nam Nguyen and Thien Tran, Virginia Tech, Blacksburg, VA</p>
10:20 – 10:35 a.m.	<p><i>Thermodynamic-guided process for production of lightweight aggregate from waste coal combustion ash and waste glass as fluxing agent</i></p> <p>Sharaniya Visvalingam[*]; Grace Hsuan, and Yaghoob Farnam, Drexel University, Philadelphia, PA</p>
10:35 – 10:50 a.m.	<p><i>Re-evaluation of LC³ environmental performance considering carbonation and strength development</i></p> <p>Farah Shahbaz[*]; Rotana Hay and Kemal Celik, New York University Abu Dhabi, Abu Dhabi, United Arab Emirates</p>
10:50 – 11:05 a.m.	<p><i>Development of low-carbon strain-hardening cementitious composite using nature pozzolan</i></p> <p>Matias Leon^{*1}; Juan Pablo Silva²; Diego Aparicio²; Alvaro Paul² and Qingxu Jin¹, (1) Michigan State University, East Lansing, MI, (2) Universidad de los Andes, Santiago, Chile</p>
11:05 – 11:20 a.m.	<p><i>Synthesising belitic calcium sulfoaluminate cement from processed aluminium salt slag</i></p> <p>Vaishnav Kumar Shenbagam[*] and Theodore Hanein, University of Sheffield, Sheffield, United Kingdom</p>
11:20 – 11:35 a.m.	<p><i>Scalable, Transportable Thermochemical Energy Storage Using Cementitious Materials</i></p> <p>Arpit Dwivedi[*]; Taly Escamilla and Aman Mehta, Cache Energy Storage Inc., Champaign, IL</p>

7:30 - 8:15 a.m.

Registration & Coffee
(Carleton Commons)

8:15 - 8:30 a.m.

Opening Remarks
(Davis Auditorium)

8:45-9:30 a.m.

Keynote lecture #1

From the Ground Up: Learning from field data to drive sustainable concrete construction

ELISE BERODIER

Freyssinet Switzerland

Moderator: Shiho Kawashima

Davis Auditorium

MEETING REGULATIONS



No photography/recording
Cell phones silent

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Note: The Society may engage photographers to photograph sessions for marketing and promotional purposes.

BREAKOUT SESSION 1B | 9:35 - 11:35 A.M. | 750 CEPSR

BIO-INSPIRED CEMENTITIOUS MATERIALS

Moderator: Christopher Shearer

Time	Description
9:35 – 9:50 a.m.	<p><i>Thermal performance of cementitious composite with bio-based phase change material microencapsulated in bioinspired coated inorganic shell</i></p> <p>Abdulmalik Bamidele Ismail*; Maysam Bahmani and Jialai Wang, The University of Alabama, Tuscaloosa, AL</p>
9:50 – 10:05 a.m.	<p><i>Mineral-forming capacity/kinetics of a nature-inspired endospore-laden polymeric fiber (BioFiber) for concrete self-healing applications</i></p> <p>Mohammad Houshmand Khaneghani; Seyed Ali Rahmaninezhad*; Divya Kamireddi; Amirreza Sadighi; Aidan Cotton; Caroline L. Schauer; Ahmad Najafi; Yaghoob Farnam; Christopher M. Sales and Reeva Street, Drexel University, Philadelphia, PA</p>
10:05 – 10:20 a.m.	<p><i>Bio-inspired silica coating for steel fibers</i></p> <p>Jialai Wang*, The University of Alabama, Tuscaloosa, AL</p>
10:20 – 10:35 a.m.	<p><i>Biologically architected calcium carbonate as a filler in portland limestone cements</i></p> <p>Danielle N. Beatty*; Madalyn C. Murphy and Wil V. Srubar III, University of Colorado Boulder, Boulder, CO</p>
10:35 – 10:50 a.m.	<p><i>Hydration kinetics, microstructure, and properties of LC3 synthesized with biologically architected CaCO_3</i></p> <p>Nicolas D. Dowdy*; Jie Ren; Danielle N. Beatty and Wil V. Srubar III, University of Colorado Boulder, Boulder, CO</p>
10:50 – 11:05 a.m.	<p><i>Development and performance assessment of nature-inspired vascular thermal-responsive composites for civil infrastructure applications</i></p> <p>Rhythm Osan; Robin Deb; Parsa Namakiaraghi; Mohammad Houshmand Khaneghani and Yaghoob Farnam*, Drexel University, Philadelphia, PA</p>
11:05 – 11:20 a.m.	<p><i>Use of algal biomass for retardation of calcium sulfoaluminate cement</i></p> <p>Cansu Acarturk* and Wil V. Srubar III, University of Colorado Boulder, Boulder, CO</p>
11:20 – 11:35 a.m.	<p><i>Investigating nature-inspired architectures for concrete reinforcement applications</i></p> <p>Parsa Namakiaraghi* and Yaghoob Farnam, Drexel University, Philadelphia, PA</p>

BREAKOUT SESSION 2A | 1:30 - 3 P.M. | DAVIS AUDITORIUM

MATERIALS CHARACTERIZATION TECHNIQUES

Moderator: Rachel E. Cook

Time	Description
1:30 – 1:45 p.m.	<i>Fluorescence mitigation in raman spectra of waste-to-energy fly ashes</i> Hamza Samouh* ; Vikram Kumar and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL
1:45 – 2 p.m.	<i>Influence of crack width on chloride penetration of UHPC under flexural loading</i> Peizhi Wang ¹ ; Randa Zeidan ² ; Kyle Austin Riding ² and Qian Zhang* ³ , (1) Florida State University, Tallahassee, FL, (2) University of Florida, Gainesville, FL, (3) FAMU-FSU College of Engineering, Tallahassee, FL
2 – 2:15 p.m.	<i>Radiation impact on C-S-H and aggregates</i> Elena Tajuelo Rodriguez* ¹ ; Aniruddha Baral ² ; William Albert Hunnicutt ³ ; Nishant Garg ² ; Lawrence M. Anovitz ¹ ; Michael C. Cheshire ¹ ; Jan Ilavsky ⁴ ; Hongbin Sun ¹ ; Ercan Cakmak ¹ ; Thomas Rossee ¹ and Yann Le Pape ¹ , (1) Oak Ridge National Laboratory, Oak Ridge, TN, (2) University of Illinois at Urbana-Champaign, Urbana, IL, (3) Columbia University, New York, NY, (4) Argonne National Laboratory, Lemont, IL
2:15 – 2:30 p.m.	<i>Estimate of concrete petrography based on prompt gamma neutron activation analysis</i> Richard A. Livingston* ¹ ; H. Heather Chen-Mayer ² and Neal S. Berke ³ , (1) University of Maryland, College Park, MD, (2) National institute of Standards and Technology, Gaithersburg, MD, (3) Tourney Consulting Group, Kalamazoo, MI
2:30 – 2:45 p.m.	<i>High-pressure materials characterization techniques for intrinsic mechanical properties of cementitious phases</i> Jiaqi Li* , Lawrence Livermore National Laboratory, Livermore, CA
2:45 – 3 p.m.	<i>Variability in phase identification and quantification of OPC cement via the x-ray diffraction and raman imaging-based methods</i> Chirayu Kothari* and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL

BREAKOUT SESSION 2B | 1:30 - 3 P.M. | 750 CEPSR

NANOTECHNOLOGY IN CEMENTITIOUS MATERIALS

Moderator: Kemal Celik

Time	Description
1:30 – 1:45 p.m.	<p><i>Nanoparticle injection technology for remediating leaks of CO₂ storage formation</i></p> <p>Linfei Li^{*1}; Mija Hubler²; Pania Newell³ and Yunping Xi², (1) University of Maine, Orono, ME, (2) University of Colorado Boulder, Boulder, CO, (3) University of Utah, Salt Lake City, UT</p>
1:45 – 2 p.m.	<p><i>Morphological, microstructural, and mechanical properties of highly-ordered calcium silicate hydrates regulated by cellulose nanocrystals (CNCs)</i></p> <p>Yuhuan Wang[*], Stevens institute of Technology, Hoboken, NJ</p>
2 – 2:15 p.m.	<p><i>Effects of AFm phase particles on the performance properties of portland cement and calcium sulfoaluminate cement pastes</i></p> <p>Monday U Okoronkwo[*], Missouri State University of Science and Technology, Rolla, MO</p>
2:15 – 2:30 p.m.	<p><i>Low concentrations of unzipped carbon nanotubes in cement concrete: Influence on micro-structure and early strength</i></p> <p>Shohana Iffat^{*1}; Fabio Matta²; Jay Gaillard³; Joseph Meany⁴ and Mohammed Baalousha², (1) Farmingdale State College, Farmingdale, NY, (2) University of South Carolina, Columbia, SC, (3) Savannah River National Laboratory, Aiken, SC, (4) Booz Allen Hamilton, McLean, VA</p>
2:30 – 2:45 p.m.	<p><i>Use of silica functionalized multi-walled carbon nanotube for high performance cementitious composites</i></p> <p>Aidyn Tugelbayev; Ji-Hyun Kim and Chul-Woo Chung[*], Pukyong National University, Busan, Republic of Korea</p>
2:45 – 3 p.m.	<p><i>Preliminary development of alumina-acrylic polymer nanoparticles for immobilizing chloride ion transport in concrete</i></p> <p>Aiysha Ashfaq^{*1}; Richard A. Livingston¹; H. Heather Chen-Mayer² and Mohamad Al-Sheikhly¹, (1) University of Maryland College Park, College Park, MD, (2) National institute of Standards and Technology, Gaithersburg, MD</p>

BREAKOUT SESSION 3A | 3:20 - 4:50 P.M. | DAVIS AUDITORIUM

CO₂ UTILIZATION TOWARDS CARBON NEUTRAL CONCRETE

Moderator: Yaghoob Farnam

Time	Description
3:20 – 3:35 p.m.	<p><i>Unlock CO₂ sequestration potential of concrete through a biomolecule-regulated carbonation process</i></p> <p>Xiaodong Wang*; Jialai Wang and Monica Amaral, The University of Alabama, Tuscaloosa, AL</p>
3:35 – 3:50 p.m.	<p><i>Emergence of viscous and precipitation-driven fingering by CO₂ injection into variably saturated portland cement mortar</i></p> <p>Laura E. Dalton* and Roi Roded, Duke University, Durham, NC</p>
3:50 – 4:05 p.m.	<p><i>Tracking spatiotemporal evolution of carbonation via raman imaging</i></p> <p>Nishant Garg*, University of Illinois at Urbana-Champaign, Urbana, IL</p>
4:05 – 4:20 p.m.	<p><i>Use of reactive magnesia cements to produce low-carbon engineered cementitious composites</i></p> <p>Nouran Elmesalami*¹; MJ Abdolhosseini² and Kemal Celik³ (1) New York University, New York, NY; (2) University of California Irvine, Irvine, CA, (3) New York University, Abu Dhabi, Abu Dhabi, United Arab Emirates</p>
4:20 – 4:35 p.m.	<p><i>Advances in calcium carbonate cement</i></p> <p>Craig W Hargis*; Seung-Hee Kang; Ying Wang; Jesus Gonzalez Pequeno and Jorge Duque, Fortera, San Jose, CA</p>
4:35 – 4:50 p.m.	<p><i>Influence of biomolecules on the phase, microstructure and mechanical properties of carbonation cured wollastonite</i></p> <p>Elvis Baffoe and Ali Ghahremaninezhad Ph.D*, University of Miami, Coral Gables, FL</p>

BREAKOUT SESSION 3B | 3:20 - 4:50 P.M. | 750 CEPSR

COMPUTATIONAL AND DATA DRIVEN MATERIALS SCIENCE

Moderator: Aleksandra Radlinska

Time	Description
3:20 – 3:35 p.m.	<p><i>Machine learning in concrete science. advancements and challenges.</i></p> <p>Zhanzhao Li^{*1}; Jinyoung Yoon^{1,2}; Rui Zhang¹; Farshad Rajabipour¹; Wil V. Srubar III³; Ismaila Dabo¹ and Aleksandra Radlińska¹, (1) The Pennsylvania State University, University Park, PA, (2) Korea Institute of Civil Engineering and Building Technology (KICT), Goyang-si, Republic of Korea, (3) University of Colorado Boulder, Boulder, CO</p>
3:35 – 3:50 p.m.	<p><i>Bayesian design of concrete with amortized gaussian processes and multi-objective optimization</i></p> <p>Olivia Pfeiffer¹; Kai Gong^{*2}; Kristen Severson³; Jie Chen⁴; Jeremy Gregory¹; Soumya Ghosh⁴; Richard Goodwin⁵ and Elsa Olivetti¹, (1) Massachusetts Institute of Technology, Cambridge, MA, (2) Rice University, Houston, TX, (3) Microsoft Research New England, Microsoft, Cambridge, MA, (4) IBM Research, IBM, Cambridge, MA, (5) Thomas J. Watson Research Center, IBM, Yorktown Heights, NY</p>
3:50 – 4:05 p.m.	<p><i>From data-driven models to material characterization: A new approach to improve durability and mechanical performance of high-early strength concretes</i></p> <p>Cesario Tavares[*], Texas A&M University, College Station, TX</p>
4:05 – 4:20 p.m.	<p><i>Machine learning-based rapid screening of SCMs for greener concrete production</i></p> <p>Yu Song[*] and Mathieu Bauchy, University of California, Los Angeles</p>
4:20 – 4:35 p.m.	<p><i>Low-cost automated orthogonal camera goniometry for accurate wettability assessment of cementitious materials</i></p> <p>Hossein Kabir[*] and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL</p>
4:35 – 4:50 p.m.	<p><i>Density functional modeling of the binding energies between aluminosilicate oligomers and different metal cations</i></p> <p>Kai Gong^{*1}; Kengran Yang² and Claire E. White², (1) Rice University, Houston, TX, (2) Princeton University, Princeton, NJ</p>

CONFERENCE SCHEDULE

DAY 2 – THURSDAY, JUNE 15, 2023

8:30 – 9:15 a.m.

Keynote lecture #2

*Processing and Reactivity of
Supplementary Cementitious
Materials*

PRANNOY SURANENI

University of Miami

Moderator: Dimitri Feys

Davis Auditorium

BREAKOUT SESSION 4A | 9:35 - 11:35 A.M. | DAVIS AUDITORIUM

SUSTAINABILITY THROUGH SUPPLEMENTARY AND ALTERNATIVE CEMENTITIOUS MATERIALS (PART 2 OF 2)

Moderator: Qingxu (Bill) Jin

Time	Description
9:35 – 9:50 a.m.	<p><i>Composition-structure-reactivity relationship for amorphous aluminosilicates in alkaline environment</i></p> <p>Kai Gong*¹; Claire E. White² and Elsa Olivetti³ (1) Rice University, Houston, TX, (2) Princeton University, Princeton, NJ, (3) Massachusetts Institute of Technology, Cambridge, MA</p>
9:50 – 10:05 a.m.	<p><i>Spatially resolved elastic moduli of magnesium silicate hydrate cements</i></p> <p>Arif Syed* and Erika Callagon La Plante, University of Texas at Arlington, Arlington, TX</p>
10:05 – 10:20 a.m.	<p><i>Synergy between limestone and slag in performance of ternary cementitious systems</i></p> <p>Doug Hooton* and Christian Pavlidis, University of Toronto, ON, Canada</p>
10:20 – 10:35 a.m.	<p><i>Effects of limestone calcined clay cement in 0-3 connectivity of piezo-electric cementitious composites</i></p> <p>Aktham Alchaar* and Kemal Celik, New York University, Abu Dhabi, United Arab Emirates</p>
10:35 – 10:50 a.m.	<p><i>Effects of calcium carbonate addition on the hydration kinetics, micro-structure, and mechanical properties of metakaolin-based geopolymers cement pastes</i></p> <p>Jie Ren*; Nicolas D. Dowdy; Danielle N. Beatty and Wil V. Srubar III, University of Colorado Boulder, Boulder, CO</p>
10:50 – 11:05 a.m.	<p><i>Spatial and temporal changes in the composition of waste-to-energy ashes</i></p> <p>Vikram Kumar* and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL</p>
11:05 – 11:20 a.m.	<p><i>Stability of synthetic zeolites in portland cement</i></p> <p>Atolo A Tuinukuafe* and Jessica M Rimsza, Sandia National Laboratories, Albuquerque, NM</p>
11:20 – 11:35 a.m.	<p><i>Evaluation of mean residence time of lightweight aggregates manufactured using waste coal-combustion ash</i></p> <p>Yousif Alqenai*¹; Mohammad Balapour²; Mohammadamin Zooyousefin¹; Nishant Shrestha¹; Y. Grace Hsuan¹; Yaghoob (Amir) Farnam¹, (1) Drexel University, Philadelphia, PA, (2) SusMaX LLC, Philadelphia, PA</p>

CONFERENCE SCHEDULE

DAY 2 – THURSDAY, JUNE 15, 2023

2:50 - 3:30 p.m.

NSF Program Director Q&A
Gianluca Cusatis

Davis Auditorium

3:30 – 4 p.m.

Business Meeting

Davis Auditorium

4 – 5 p.m.

Della Roy Lecture

*Hindsight, Foresight, and
Insight: Calorimetry and
Chemical Shrinkage through
the Years*

DALE BENTZ

Engineering Laboratory at the
National Institute of Standards
and Technology (retired)

Moderator: Alexander Brand

Davis Auditorium

5 – 7 p.m.

Della Roy Reception and
Poster Session

Carleton Commons

BREAKOUT SESSION 4B | 9:35 - 11:35 A.M. | 750 CEPSR

DURABILITY AND SERVICE-LIFE MODELING

Moderator: Elena Rodriguez

Time	Description
9:35 – 9:50 a.m.	<i>Assessment of irradiation damage in concrete via correlative imaging</i> Krishna C Polavaram* and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL
9:50 – 10:05 a.m.	<i>Recent advancements in chemo-mechanical modeling on the cementitious materials exposed to harsh environments: An overview</i> Jin-Ho Bae* ; Joonho Seo; Taegeon Kil; Naru Kim and H.K. Lee, Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea
10:05 – 10:20 a.m.	<i>Pore structure and permeability of alkali-activated calcined clay as durability indicators</i> Anita Zhang* and Claire E. White, Princeton University, Princeton, NJ
10:20 – 10:35 a.m.	<i>Development of self-heating concrete using low-temperature phase change materials: Long-term freeze-thaw durability, snow-melting efficiency, and service-life modeling for pavement applications</i> Robin Deb* ; Victor Onukwugha; Anas Talouli; Priscilla Kirabo and Yaghoob Farnam, Drexel University, Philadelphia, PA
10:35 – 10:50 a.m.	<i>Service life models for cracked concrete</i> Savitha Sagari Srinivasan* and Raissa Ferron, University of Texas at Austin, Austin, TX
10:50 – 11:05 a.m.	<i>Why is pyrrhotite so pernicious to concrete?</i> Aron Newman* ; Stephanie Watson and Michael Mengason, National Institute of Standards and Technology, Gaithersburg, MD
11:05 – 11:20 a.m.	<i>Application of a nonlinear kinetics model to ettringite expansion data</i> Nour Alkhalouf* ; Richard A. Livingston and Amde M. Amde, University of Maryland, College Park, MD
11:20 – 11:35 a.m.	<i>Development of resource efficient non – proprietary ultra-high-performance concretes in the US</i> Bijaya Rai* and Kay Wille, University of Connecticut, Storrs, CT

BREAKOUT SESSION 5A | 1 - 2:30 P.M. | DAVIS AUDITORIUM

CEMENT CHEMISTRY (PART 1 OF 2)

Moderator: Laura Dalton

Time	Description
1:00 – 1:15 p.m.	<i>Elucidating the mineralogy of hydrated non-portland cements: Formation and stability of gismondine-type zeolite</i> Monday U Okoronkwo* , Missouri University of Science and Technology, Rolla, MO
1:15 – 1:30 p.m.	<i>Early-age hydration of synthetic zinc and manganese-doped calcium aluminoferrite in the presence of carbonates</i> Aniruddha Baral* , Cecilia Pesce; Claire Utton; Hajime Kinoshita; Nicola Morley; John Provis and Theodore Hanein, The University of Sheffield, Sheffield, United Kingdom
1:30 – 1:45 p.m.	<i>Mineralization and phase stability of alkali-activated cements with high magnesium and phosphate content, a promising buffer material for long-term immobilization of high-level nuclear waste</i> Titus M Reed* and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA
1:45 – 2 p.m.	<i>Dissolution kinetics of silica fume in alkaline solutions</i> Yoonjung Han ¹ ; Jonathan L. Lapeyre ¹ ; Umme Zakira ¹ ; Mine G. Ucak-Astarlioglu ² ; Jedadiah F Burroughs ² and Jeffrey W. Bullard* ¹ , (1) Texas A&M University, College Station, TX, (2) U.S. Army Engineer Research and Development Center, Vicksburg, MS
2 – 2:15 p.m.	<i>Hydration and microstructural development of LC3 cements in the long-term: bridging the gap between experiments and thermodynamic modeling</i> Franco Zunino ^{1*} and Karen Scrivener ² (1) ETH Zürich, Zürich, Switzerland (2) EPFL STI IMX LMC, Lausanne, Switzerland
2:15 – 2:30 p.m.	<i>Framework for concrete mix design incorporating steel slags</i> Tunahan Aytas* ; Brian Traynor; Yixi Tian and Elsa Olivetti, Massachusetts Institute of Technology, Cambridge, MA

BREAKOUT SESSION 5B | 1 - 2:30 P.M. | 750 CEPSR

ADDITIVE MANUFACTURING AND RHEOLOGY OF CEMENTITIOUS MATERIALS
(PART 1 OF 2)

Moderator: Mo Li

Time	Description
1 – 1:15 p.m.	<i>High Filler, Low Water (HFLW) Cement-Based Mixtures for Carbon Emissions Reduction</i> Denise A Silva* , Oak Ridge National Laboratory, CA
1:15 – 1:30 p.m.	<i>Suggested modifications to ASTM C31 after a century of rodding specimens 25 times for each layer</i> Dimitri Feys ¹ ; Paige Toebben ¹ ; Alexander Zarate ¹ ; Kyle Riding ² ; and Ahmed Abd El Fattah ³ , (1) Missouri University of Science and Technology, Rolla, MO, (2) University of Florida, Gainesville, FL, (3) King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia
1:30 – 1:45 p.m.	<i>Rheology of cement pastes with calcium carbonate polymorphs</i> Diandian Zhao* ; Jonah M. Williams; Ah-Hyung Alissa Park and Shiho Kawashima, Columbia University, New York, NY
1:45 – 2 p.m.	<i>Active stiffening control of additive manufacturing process using aluminum sulfate-based accelerators: Possibilities and challenges</i> Abdul B Peerzada* ¹ ; Scott Jones ² ; Prasad Rao Rangaraju ¹ ; James M Roberts ¹ and Adam Biehl ¹ , (1) Clemson University, Clemson, SC, (2) National Institute of Standards and Technology, Gaithersburg, MD
2 – 2:15 p.m.	<i>Chemomechanical properties of 3D printed cement pastes containing halloysite nanoclay</i> Michael T Kosson* ; Lesa Brown and Florence Sanchez, Vanderbilt University, Nashville, TN
2:15 – 2:30 p.m.	<i>Using vibration to control rheology of concrete</i> Karthik Pattaje S. ^{*1,2} and David Lange ¹ , (1) University of Illinois at Urbana Champaign, Urbana, IL, (2) Wiss, Janney, Elstner Associates

8:30 – 9:30 a.m.

Industry Talks

How to bridge the gap between research and practice

SCOTT SCHNEIDER

Thornton Tomasetti

MATT D'AMBROSIA

MJ2 Consulting

GEORGE PERRY

Black Buffalo 3D

Moderator: Wil V. Srubar III

Davis Auditorium

BREAKOUT SESSION 6A | 9:50 - 11:20 A.M. | DAVIS AUDITORIUM

CEMENT CHEMISTRY (PART 2 OF 2)

Moderator: Monday Okoronkwo

Time	Description
9:50 – 10:05 a.m.	<p><i>Effect of processing conditions on calcium [alumino] ferrite formation in the presence of manganese</i></p> <p>Cecilia Pesce^{*1}; Aniruddha Baral²; Claire Utton¹; Hajime Kinoshita¹; Nicola Morley¹; John Provis¹ and Theodore Hanein¹, (1) The University of Sheffield, United Kingdom, (2) University of Illinois at Urbana-Champaign, Urbana, IL</p>
10:05 – 10:20 a.m.	<p><i>Binding chemistry of Cs(I), Sr(II), Ce(III), and I(VII) ions in novel Mg-Al-P cementitious materials</i></p> <p>Yi Xiang[*]; Matthew Hollingham and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA</p>
10:20 – 10:35 a.m.	<p><i>CO₂ mineralization of silicate minerals and the potential inhibiting effect of amorphous silica-rich surface layers</i></p> <p>Kumaran Coopamootoo^{*1}; John J Valenza² and Claire E. White¹, (1) Princeton University, Princeton, NJ, (2) ExxonMobil, Annandale, NJ</p>
10:35 – 10:50 a.m.	<p><i>Measuring Mineralized Carbon in Cementitious Materials by a Digestion-Titration Approach</i></p> <p>Thien Tran¹; Rachel Cook^{2*}; Olajide O. Ipindoala²; Aron Newman²; Paul Stutzman²; and Alexander Brand¹, (1) Virginia Tech, Blacksburg, VA (2) National Institute of Standards and Technology, Gaithersburg, MD</p>
10:50 – 11:05 a.m.	<p><i>Effect of nanoparticles on the hydration and carbonation of reactive magnesium oxide cement</i></p> <p>Padmaja Krishnan and Kemal Celik[*], New York University, Abu Dhabi, Abu Dhabi, United Arab Emirates</p>
11:05 – 11:20 a.m.	<p><i>Prediction of compressive strength of cement paste incorporating copper mine tailing using machine learning techniques</i></p> <p>Hee-Jeong Kim[*], University of Arizona, Tucson, AZ</p>

11:40 a.m. – 12 p.m.

Closing session

Davis Auditorium

BREAKOUT SESSION 6B | 9:50 - 11:20 A.M. | 750 CEPSR

ADDITIVE MANUFACTURING AND RHEOLOGY OF CEMENTITIOUS MATERIALS
(PART 2 OR 2)

Moderator: Sriramy Nair

Time	Description
9:50 – 10:05 a.m.	<p><i>Design, fabrication, and mechanics of bone-inspired tough architected cement-based materials</i></p> <p>Shashank Gupta*; Aïmane Najmeddine and Reza Moini, Princeton University, Princeton, NJ</p>
10:05 – 10:20 a.m.	<p><i>Role of rheology in interlayer microstructure and properties of additively manufactured cementitious materials</i></p> <p>Yun-Chen Wu, Xinbo Wang, Wei Geng* and Mo Li</p>
10:20 – 10:35 a.m.	<p><i>Round-Robin Tests on Concrete Rheometry by RILEM TC-266: MRP: Flow curve analysis</i></p> <p>Dimitri Feys¹; Yannick Vanhove²; Khadija El-Cheikh³; Helena Keller⁴; Egor Secrieru⁵, (1) Missouri University of Science and Technology, Rolla, MO, (2) Université d'Artois, Bethune, France, (3) Ghent University, Ghent, Belgium, (4) Schleibinger Geräte, Germany, (5) Heidelberg Cement, Germany</p>
10:35 – 10:50 a.m.	<p><i>Enhancing rheology of ultra-high-performance concrete (UHPC) mixes through optimization of particle packing and water demand</i></p> <p>Bayezid Baten*; Hamza Samouh and Nishant Garg, University of Illinois Urbana Champaign, Urbana, IL</p>
10:50 – 11:05 a.m.	<p><i>Potential use of granulated cork as sand replacement in design of eco-friendly lightweight 3D printed concrete</i></p> <p>Hanbin Cheng*; Aleksandra Radlińska; Jose Pinto Duarte; Ali M. Memari; Sven Bilén and Shadi Nazarian, Pennsylvania State University, University Park, PA</p>

KEYNOTE SPEAKER #1**ELISE BERODIER**

Freyssinet Switzerland

WEDNESDAY, JUNE 14 | 8:30 - 9:15 A.M.***FROM THE GROUND UP: LEARNING FROM FIELD DATA TO DRIVE SUSTAINABLE CONCRETE CONSTRUCTION*****Abstract**

The recent increase in awareness surrounding concrete construction and its impact on the environment has led to an important number of innovations. There is a growing need for the concrete industry to shift towards more sustainable practices. However, while there is a significant amount of research being conducted on low carbon cements, the application of the material in real life scenarios is not receiving the same level of research attention. Part of the problem is the lack of comprehensive data from the field.

This talk provides an analysis of the challenges that the concrete industry is facing based on data collected from the field and how cement and concrete research can address these needs.

Biography

Elise Berodier is a business development and technical manager at Freyssinet Switzerland. With over 10 years of experience in the field of cement and concrete industry and academia, she has gained a deep understanding of the challenges facing the sector and had worked to develop innovative solutions. She holds a PhD from EPFL under the supervision of Prof. Karen Scrivener in 2015. Since then, she worked in industry and academia in USA and Switzerland, where she developed new solutions for the industry, an area that remains a central focus of her work to this day. Today Elise works at Freyssinet, a leading international construction company where she continues to develop solutions for engineers to repair and maintain infrastructures.

KEYNOTE SPEAKER #2**PRANNOY SURANENI**

University of Miami

THURSDAY, JUNE 15 | 8:30 - 9:15 A.M.***PROCESSING AND REACTIVITY OF SUPPLEMENTARY CEMENTITIOUS MATERIALS*****Abstract**

Supplementary cementitious materials (SCMs) are critical for the continued production of sustainable and durable concrete and are key for concrete decarbonization. Due to shortfalls of conventional SCMs in recent years, there is a growing need to rapidly identify and understand the performance of alternative of SCMs. We discuss new reactivity tests to measure SCM reactivity, including the modified R3 test. The reactivity of a large number of alternative SCMs is quantified and described here and the importance of reaction kinetics is highlighted. Synthetic calcium aluminosilicate glasses are important model systems for SCMs, and we discuss their composition-structure-reactivity relationships. SCM processing and manufactured SCMs have become increasingly critical and are currently being explored by numerous start-ups. An overview of mechanochemical activation and thermal activation of inert materials and the ensuing reactivity is provided.

Biography

Prannoy Suraneni is the Miami Engineering Career Development Assistant Professor in the Civil and Architectural Engineering Department at the University of Miami where he heads the Advanced Cement Chemistry, Engineering, Sustainability, and Science Lab (ACCESS Lab). The major research thrusts of the lab are supplementary cementitious materials (SCMs) and coastal infrastructure. The lab has received continuous federal funding since 2019, which is expected to continue until at least 2027. Dr. Suraneni has won numerous prestigious awards, including the UM College of Engineering David J. Sumanth Early Career Research Award, and the RILEM Gustavo Colonnetti Medal.

**DALE BENTZ**

HINDSIGHT, FORESIGHT, AND INSIGHT: CALORIMETRY AND CHEMICAL SHRINKAGE THROUGH THE YEARS

Abstract

Calorimetry and chemical shrinkage are perhaps two of the most straightforward measurements that can be performed on cement-based materials. As this lecture will illustrate, they are also two of the most informative. Following the seminal works of Powers and Carlson in the 1930's, these measures emerged from a 50-year near-hibernation in the 1980's and have proven invaluable in the ensuing years. The standardization of both measurements as ASTM test methods provided a foundation for their application to numerous concrete scenarios of practical interest. Through its linkage to autogenous shrinkage, chemical shrinkage has been applied as a fundamental test for understanding early-age cracking, debating optimal cement fineness, and popularizing internal curing into the mainstream. Calorimetry, both isothermal and semiadiabatic, has proven equally versatile with its applications to basic hydration studies, quality assurance, optimizing sulfate content, troubleshooting cement/admixture interactions, and predicting strength development. These two measurements will continue to prove invaluable in the years to come in the emerging areas of 3-D printing, low carbon multi-component binders including current IL cements, and offshore wind applications.

Biography

Dale Bentz retired from the Engineering Laboratory at the National Institute of Standards and Technology in 2018 with 34 years of service. At NBS/NIST, his research focused on experimental and computer modeling studies of cement-based and fire resistive materials. He is a former chairperson of the ACerS Cements Division. Throughout his career, he was active in ACerS (Brunauer Award), ACI (Fellow, Wason Medal and Willson Award), ASTM (Honorary Membership in C01), and RILEM (L'Hermite Medalist). In 2019, he was inducted into the NIST Portrait Gallery of Distinguished Alumni.

**SCOTT SCHNEIDER**

Thornton Tomasetti

**MATTHEW D'AMBROSIA**

MJ2 Consulting

**GEORGE PERRY**

Black Buffalo 3D

HOW TO BRIDGE THE GAP BETWEEN RESEARCH AND PRACTICE

Scott Schneider is a co-leader of Thornton Tomasetti's Structural Engineering Practice. He has extensive experience designing and managing complex building projects. Scott's design flexibility is reflected in his portfolio, which consists of a diverse mix of government, cultural, office, residential, and hospitality work. He has been involved in such notable projects as the 1200 Avenue at Port Imperial luxury condominium complex in Weehawken, New Jersey, the 2-million-square-foot United States Department of Transportation Headquarters in Washington, D.C., the Obama Presidential Center in Chicago and the U.S. Embassy in London, U.K., as well as several other U.S. embassies and federal buildings. Scott has a strong background in digital design and building information modeling. He uses a range of technologies and approaches throughout all phases of a project, improving coordination and collaboration while keeping on schedule and within budget.

Matthew D'Ambrosia, PhD, PE, FACI is Principal and Co-Founder of MJ2 Consulting where he specializes in solving difficult problems for the construction industry. Dr. D'Ambrosia has over 20 years of experience in concrete materials behavior and research. His interests include materials optimization for specialized applications, durability-related mechanisms such as volume change and cracking, as well as new approaches for prediction and verification of service life and sustainability. He has expertise with large infrastructure projects throughout the world, such as tall buildings, bridges, highways, dams, and power plants. He is a Licensed Professional Engineer in thirteen states. Dr. D'Ambrosia teaches instructional courses for the industry and is Adjunct Professor in the Department of Civil and Environmental Engineering at Northwestern University. He is a Fellow of the American Concrete Institute (FACI), where he currently serves as Chair of ACI 562J on Repair Materials and ACI 209C on Creep and Shrinkage, voting member of ACI 318A and numerous other committees. He is a member of and former Chair of the ACerS Cements Division. He received his B.S. in Civil Engineering from the University of Iowa, and M.S. and Ph.D. in Civil Engineering from University of Illinois at Urbana-Champaign.

George Perry is the Head of Technology with Black Buffalo 3D, a leading supplier of 3D construction solutions. George's studied Civil Engineering at Stevens Institute of Technology, and spent the beginning of his career in structural design and concrete construction. He spent the next 8 years as the Director of Engineering at Solidia Technologies, a startup focused on scaling synthetic calcium silicate cement. In this role, George led the team responsible for the engineering scale-up of process equipment that managed the carbonation reaction. At Black Buffalo 3D, George manages the technical and operations teams, which are responsible for printer design, material design, and field operations.

JUNE 15 (THURSDAY)

POSTER SESSION POSTERS 5 – 7 pm

Evaluating the effects of sodium and aluminum on nanostructural features of calcium silicate hydrates using atomistic modeling and pair distribution function analysis

Debra A. Keiser and Claire E. White, Princeton University, Princeton, NJ

Early-age and long-term performance of strain-hardening cementitious composite using high replacement of Chilean natural pozzolan

Diego Aparicio¹, Juan Pablo Silva¹, Matias Leon², Qian Zhang³, Qingxu Jin² and Alvaro Paul¹, (1) Universidad de los Andes, Santiago, Chile, (2) Michigan State University, East Lansing, MI, (3) FAMU-FSU College of Engineering, Tallahassee, FL

Development of UHPC with limestone calcined clay cement (LC3) binder- a feasibility study

Emily Mank¹, Nankyoung Lee², and Qian Zhang¹, (1) FAMU-FSU College of Engineering, Tallahassee, FL, (2) Seoul National University, Seoul, Republic of Korea

Performance of recycled cement paste as a solidifying agent for radioactive waste immobilization

Yu-Jin Choi, Ji-Hyun Kim and Chul-Woo Chung, Pukyong National University, Busan, Republic of Korea

Effect of MgO/MgSO₄ ratio and MK content on magnesium oxysulfate cement setting

Abdullah Y A Y Alsadi, Yousra Timounay, and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA

Effect of metakaolin and hemp on the mechanical properties of magnesium oxysulfate cement

Yousra Timounay and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA

Femtosecond laser processing of basalt for carbon negative cementitious materials

Isabella Ortolan, Albert Suceava, Venkatraman Gopalan and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA

Evaluation of hydration phases that form under extreme subsurface environments

Lyn Zemberekci and Sriramya D Nair, Cornell University, Ithaca, NY

Characteristics of cement paste with calcium phosphates for potential application of geologic CO₂ sequestration

Ji-Hyun Kim, Joeng Jin Son, and Chul-Woo Chung, Pukyong National University, Busan, Republic of Korea

Sonication energy for dispersion of multi-walled carbon nanotubes

Hwan Lee, Eugenea Hajila Njenga, Savitha Sagari Srinivasan, and Raissa Ferron, University of Texas at Austin, Austin, TX

Nano-C-S-H synthesis techniques for a more durable concrete

Eugenea Hajila Njenga, Hwan Lee, Savitha Sagari Srinivasan, and Raissa Ferron, University of Texas at Austin, Austin, TX

Development of high strength lightweight cementitious composite with multi-walled carbon nanotube (MWCNT)

Seong Woo KIM, Ji-Hyun Kim, and Chul-Woo Chung, Pukyong National University, Busan, Republic of Korea

Exploring the mechanical performance, reactivity, and 3D printability of cementitious composites using lunar and martian regolith simulants

Xiaoqiang Ni, Matias Leon, Nathan Denning, Michael Velbel and Qingxu (Bill) Jin, Michigan State University, East Lansing, MI

Rheological performance of limestone calcined clay cement (LC3) for 3D-printing applications

Michelle Y Wong, and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA

Evaluation of behavior of cement-based materials in binder jetting 3D printing process

Mursaleen Shahid, UNITN, Trento, Italy

Review and meta-analysis of rapid reactivity testing parameters' role in reactivity and strength determination for supplementary cementitious materials

Dia M. Brown and Juan Pablo Gevaudan, Pennsylvania State University, State College, PA

Applicability of depth-specific evaluation on deterioration using resonance frequency measurement of disk specimen

Joeng Jin Son¹, Min-Suk Kim², Chang-Joon Lee², and Chul-Woo Chung¹, (1) Pukyong National University, Busan, Republic of Korea, (2) Chungbuk National University, Cheongju, Republic of Korea

Evaluation of South Dakota aggregate as martian simulants

Zoey Thies¹, Jennifer Edmunson², Douglas Rickman² and **Christopher Shearer**¹, (1) South Dakota School of Mines and Technology, Rapid City, SD, (2) NASA Marshall Space Flight Center, Huntsville, AL

Techniques to halt the reaction of alkali-activated materials

Abu Naser Rashid Reza, Luke Koski, Leonhardt T. Thinley and **Christopher Shearer**, South Dakota School of Mines and Technology, Rapid City, SD

The effect of temperature on early age behavior of blended CSA cements

Olajide Olaniyi Ipindola¹, Rachel Elizabeth Cook^{1,2}, Aron Newman¹, Scott Jones¹ and Shawn Platt¹, (1) National Institute of Standards and Technology, Gaithersburg, MD, (2) Missouri University of Science and Technology, Rolla, MO

Enhancing mineralogical understanding of fly and bottom ashes via raman imaging

Andrew Christopher Witte and Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL

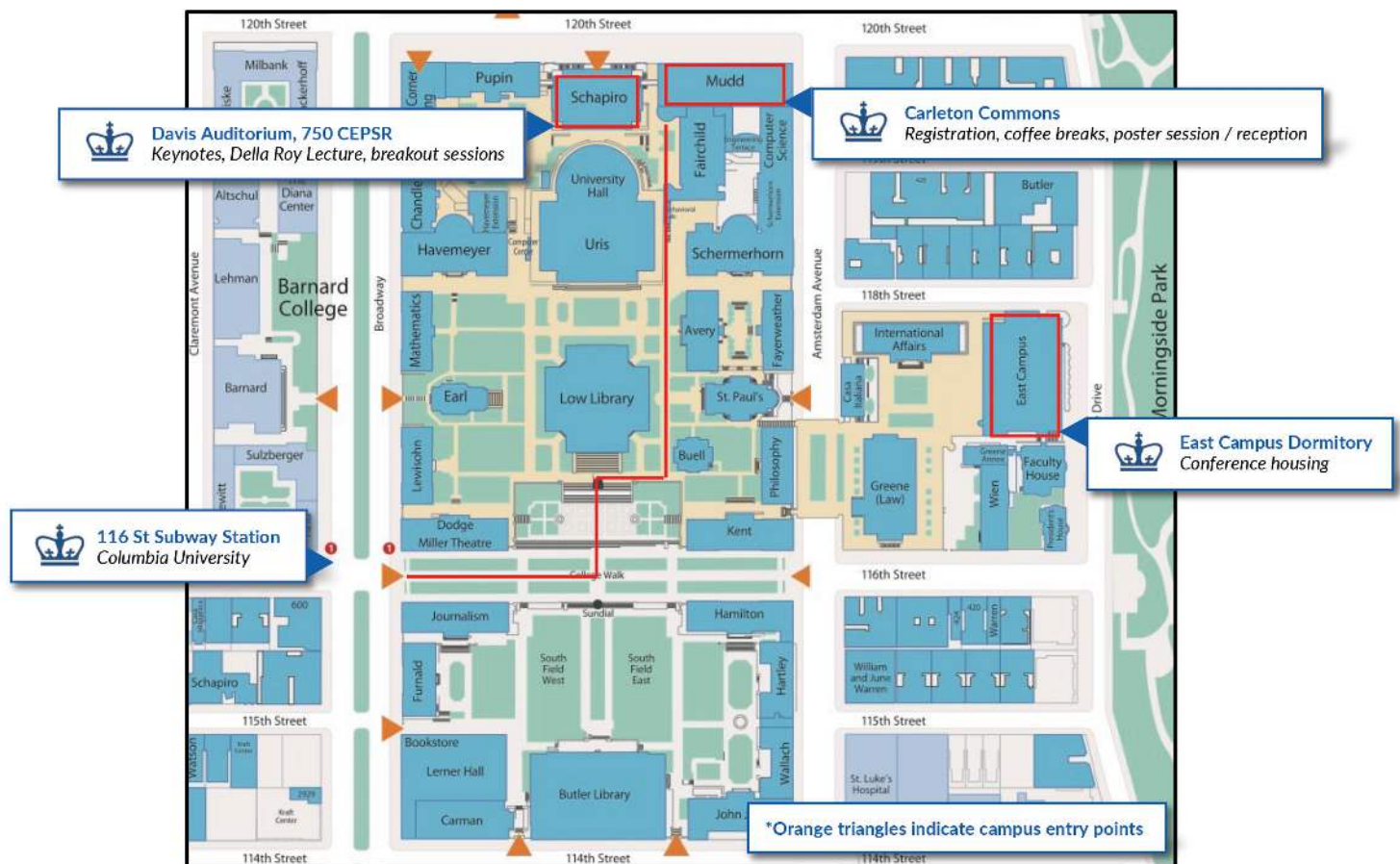
Changes in critical strain of hydrating Portland cement pastes

Palash Badjatya^{*} and Shihoh Kawashima, Columbia University, New York, NY

Mechanochemical Activation of Inert Fillers

Sofiane Amroun^{*}, Luca Galli and Prannoy Suraneni, University of Miami, Miami, FL

CAMPUS MAP



REGISTRATION OPENS

JULY 1, 2023

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