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10TH ADVANCES IN CEMENT-BASED MATERIALS

June 16 – June 18, 2019 | University of Illinois at Urbana-Champaign | Newmark Civil Engineering Lab
205 N. Mathews | Urbana, IL USA

PROGRAM

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The Cements Division of

The American Ceramic Society
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10TH ADVANCES IN CEMENT-BASED MATERIALS

SCHEDULE OF EVENTS

SUNDAY, JUNE 16

Registration	1:00pm - 5:00pm
ERDC – CERL Tour	12:30pm - 2:00pm
NIST Workshop (Yeh Center, Newmark Civil Engineering Lab (NCEL) 205 N. Mathews)	2:00pm - 5:00pm
Student Reception (Illini Union Rec Room)	6:00pm - 8:00pm

MONDAY, JUNE 17

Registration & Coffee (Newmark Civil Engineering Lab (NCEL), 205 N. Mathews)	7:00am - 8:30am
Opening Remarks	8:30am - 8:45am
Keynote #1	8:45am - 9:15am
Breakout Session 1a and 1b	9:30am - 11:30am
Lunch on your own	11:30am - 1:00pm
Breakout Session 2a and 2b	1:00pm - 2:15pm
Breakout Session 3a and 3b	2:30pm - 3:45pm
Move to Beckman and setup posters	
Business Meeting	4:15pm - 4:30pm
Della Roy Lecture	4:30pm - 5:30pm
Poster Session	5:30pm - 7:00pm
Della Roy Reception	7:00pm - 9:00pm

TUESDAY, JUNE 18

Coffee (NCEL)	8:00am - 8:45am
Keynote #2	8:45am - 9:15am
Faculty Panel on 10th Anniversary	9:30am - 10:15am
Breakout Session 4a and 4b	10:30am - 12:30pm
Boxed Lunches	12:30pm - 2:00pm
Breakout Session 5a and 5b	2:00pm - 4:00pm
Poster and YouTube Award Ceremony	4:15pm - 5:00pm

DELLA ROY LECTURE

Monday, June 17 | 4:30 – 5:30 pm
Beckman Auditorium Room 1025

David Lange, University of Illinois at Urbana-Champaign, Urbana, IL

Title: *Beyond the Science*

David A. Lange is Professor of Civil Engineering at the University of Illinois at Urbana-Champaign. He arrived at Illinois in 1992, and developed a research group focusing on concrete materials, including microstructure-property relationships, characterization of pore structure, drying phenomenon and measurement of internal relative humidity gradients, shrinkage/creep, and cracking. Special topics such as self-consolidating concrete, recycled concrete aggregate, internal curing with superabsorbent polymers, and 3D printing have also drawn his attention. Lange served as Associate Head of the Department of Civil and Environmental Engineering from 2004-10. He is a Fellow of the American Ceramic Society. He is also a Fellow of the American Concrete Institute and winner of its Wason Medal in 2003 and 2018. He served as ACI President in 2018-19.

RECEPTION | 7 – 9 pm
BECKMAN ATRIUM

POSTER SESSION

Monday, June 17, 2019
5:30 – 7pm
Beckman Atrium

For complete poster listings see insert A and B

PARKING: There's limited metered parking on first floor of the parking deck closest to the venue: Address is: **North Campus Parking Deck, 1201 W University Ave, Urbana, IL 61801**. We encourage walking to the venue as parking on campus is limited.

CONFERENCE SCHEDULE

MONDAY, JUNE 17, 2019

ORAL PRESENTATIONS (12 minutes)
Q&A (3 minutes)

8:30 – 9:15 am

Opening Session:

Welcome and keynote speaker:

Timothy Wangler
ETHZ, Zurich, Switzerland

9:30 – 11:30 am—Breakout Session #1a—NCEL 1310

SUPPLEMENTARY CEMENTITIOUS MATERIALS

Early-age shrinkage of alkali activated class f fly ash and portland cement cured at different temperatures

Maria Juenger, University of Texas at Austin, Austin, TX

Modification of crumb rubber cement interface with shrinkage reducing admixture and its effect on mechanical performance

Robbie M. Damiani, University of Illinois at Urbana-Champaign, Urbana, IL

Ti k-edge XAS and EPR study of the glassy structure of amorphous blast-furnace slags used in cement, relation with the mechanical properties of the cement

Domitille Le Cornec, ATILH, France; IMPMC, Sorbonne Université, France

Volume changes at the early age of the geopolymerisation reaction

Francesca Lolli, Georgia Institute of Technology, Atlanta, GA

Characterization of MgO cement pastes exposed supercritical carbonation

Rotana Hay, New York University, Abu Dhabi, UAE

The performance of calcined clay based on impure or purified kaolinite in concrete

Khashayar Jafari, Pennsylvania State University, State College, PA

Phosphate-base cements: Reactions, microstructure and performance

Hongyan Ma, CArE, Missouri University of Science and Technology, Rolla, MO

Dissolution Kinetics of Calcined Clays - Evidence of Reactive Pentahedral Al sites

Nishant Garg, University of Illinois at Urbana-Champaign, Urbana, IL

9:30 – 11:30 am—Breakout Session #1b—NCEL 2310

CEMENT CHEMISTRY

Evaluating the autoclave expansion test as a performance measure of deleterious levels of periclase in cement?

Robert Douglas Hooton, University of Toronto, Toronto, ON, Canada

Microgravity effect on porosity and crystal growth of portland cement paste

Juliana M. Neves, Pennsylvania State University, State Collge, PA

Factors affecting the sulfation level of portland cements

Jeffrey J Thomas, GCP Applied Technologies, Cambridge, MA

Direct observation of C3S hydration using fast x-ray nano computed tomography

Tyler Ley, Oklahoma State University, Stillwater, OK

Structure and nanomechanical properties of (Al-)tobermorite and calcium (alumino) silicate hydrate, a high-pressure x-ray diffraction study

Jiaqi Li, University of California, Berkeley, CA

Does your concrete need vitamin c?: Naturally occurred compounds as next generation "green" additive for concrete

Jialai Wang, The University of Alabama, Tuscaloosa, AL

Hydration kinetics of tricalcium aluminate and calcium sulfate mixtures with varying water activity

Jonathan L. Lapeyre, Missouri University of Science and Technology, Rolla, MO

pH- and water-responsive polymers improve fresh- and hardened-state properties of cement paste

Anastasia N. Aday, University of Colorado Boulder, Boulder, CO

CONFERENCE SCHEDULE

MONDAY, JUNE 17, 2019

ORAL PRESENTATIONS (12 minutes)
Q&A (3 minutes)

DURABILITY

1:00 – 2:15 pm—Breakout Session #2a—NCEL 1310

Stochastic model for predicting the service life of reinforced concrete bridge decks

Leonidas P. Emmenegger, Georgia Institute of Technology, Atlanta, GA

Beyond aeas: Can biomimetic antifreeze polymers enhance the freeze-thaw resistance of cement paste?

Wil V. Srubar III, PhD, University of Colorado Boulder, Boulder, CO

Implications of climate change on durability of concrete structures

Mija Hubler, University of Colorado Boulder, Boulder, CO

Detecting and imaging ASR cracking in concrete using ultrasonic scatter measurements

John S. Popovics, University of Illinois at Urbana-Champaign

Evaluation of gamma irradiation damage in c-s-h

Elena Tajuelo Rodriguez, Reactor and Nuclear Systems Division, Oak Ridge National Laboratory, Oak Ridge, TN

NANOTECHNOLOGY

1:00 – 2:15 pm—Breakout Session #2b—NCEL 2310

Nano-core effect in nano-engineered cementitious materials

Zhen Li, School of Civil Engineering, Dalian University of Technology, Northwestern University, Evanston, IL

Engineering thermal and viscoelastic properties of calcium-silicate-hydrates (C-S-H) via organic-inorganic crosslinking

Konrad J. Krakowiak, UH, Houston, TX

Characterization of the degree of dispersion of carbon nanotubes in cementitious nanocomposites through impedance spectroscopy

Panagiotis A. Danoglidis, Department of Civil Engineering, Democritus University of Thrace, Xanthi, Greece

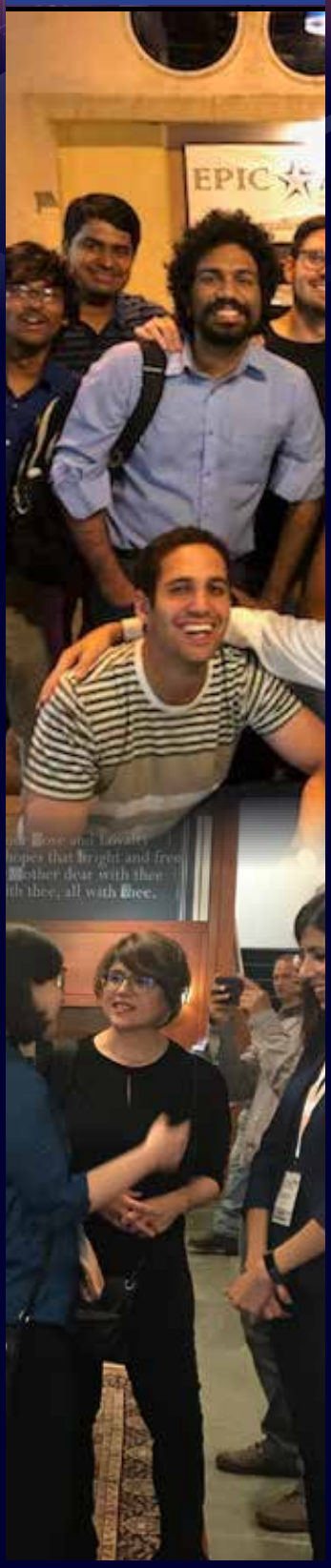
Fracture mechanics of cellulose nanofibrils modified ultra-high performance concrete

Yi Peng, Civil Engineering, University of Maine, Orono, ME

CONFERENCE SCHEDULE

MONDAY, JUNE 17, 2019

ORAL PRESENTATIONS (12 minutes)
Q&A (3 minutes)



MATERIALS CHARACTERIZATION TECHNIQUES

2:30 – 3:45 pm—Breakout Session #3a—NCEL 1310

Cementitious creep for multiple stress states and implications for isotropic viscoelasticity

Christopher Jones, Kansas State University, Manhattan, KS

Optimization of cellular concrete for improved impact resistant infrastructure

Jamie V. Clark, University of Illinois at Urbana-Champaign, Urbana, IL

Micromechanical response of crystalline phases in alternate cementitious materials using 3-d x-ray techniques

Sriramya D. Nair, Cornell High Energy Synchrotron Source, Ithaca, NY

Using deep learning and stereological techniques for a 3D concrete freeze-thaw evaluation

Yu Song, University of Illinois at Urbana-Champaign, Urbana, IL

Multiscale pore structure determination of alkali-activated metakaolin via simulation and experiment: Micropores to macropores

Kengran Yang, Princeton University, Princeton, NJ

CEMENT CHEMISTRY

2:30 – 3:45 pm—Breakout Session #3b—NCEL 2310

Dissolution behavior and near-surface composition of tricalcium aluminate in low activity sulfate solutions

Alexander S. Brand, Virginia Tech, Blacksburg, VA

Dissolution kinetics of calcium salts under different environmental conditions

Qingxu Jin, Civil & Environmental Engineering, Georgia Institute of Technology, Atlanta, GA

Research on hydration and the properties of portland cement with bicine

Xin Cheng, University of Jinan, Jinan, China

The effects of size classification and various filler types on tricalcium silicate hydration

Rachel Elizabeth Cook, Missouri University of Science and Technology, Rolla, MO

Multifunctional self-sensing and ductile cementitious materials

Mo Li, University of California, Irvine, Irvine, CA

CONFERENCE SCHEDULE

TUESDAY, JUNE 18, 2019

ORAL PRESENTATIONS (12 minutes)
Q&A (3 minutes)

8:45 – 9:15 am

Keynote speaker:

Zach Grasley
Texas A & M University

9:30 – 10:15 am

Reflections on the 10th Anniversary of Cements Meeting

Panelists:

Surendra Shah
Northwestern University

Doug Hooton
University of Toronto

Maria Juenger
University of Texas, Austin

10:30 am– 12:30 pm—Breakout Session #4a—NCEL 1310

ADDITIVE MANUFACTURING

Marscrete: A waterless concrete for 3D printing applications on mars
Kavya Mendu, Civil and Environmental Engineering, Northwestern University, Evanston, IL

Controlling 3D printable concrete by vibration
Karthik Pattaje S., University of Illinois at Urbana-Champaign, Urbana, IL,

Potential of using ternary binders for digital fabrication with concrete
Arnesh DAS, Civil Engineering, ETHZ, Zurich, Switzerland; Physical chemistry of building materials - ETH Zürich, Zürich, Switzerland

Combination of nanoclay and vma to tailor the rheology and printing performance of fresh cement-based systems
Ala Eddin Douba, Columbia University, New York, NY

Early age rheological properties and deformations of 3D-printed cement-based materials
Mohamadreza Moini, Lyles School of Civil Engineering, Purdue University, West Lafayette, IN

The effect of geometry and material characteristics on modeling extrusion of 3D printable binders
Sooraj A. O. Nair, Arizona State University, Tempe, AZ

Computational printing of cement-based pastes in 2D and 3D geometries
Abdul Salam Mohammad, Tennessee Technological University, Cookeville, TN

Characterization of 3D printed cement pastes
Michael T. Kosson, Vanderbilt University, Nashville, TN

10:30 am– 12:30 pm—Breakout Session #4b—NCEL 2310

COMPUTATIONAL METHODS

Nanolayered attributes of calcium-silicate-hydrate gels
Ali Morshedifard, University of California Irvine, Irvine, CA

Unveiling the atomic structure of ground granulated blast-furnace slag by combining multiple computational tools with x-ray and neutron scattering
Kai Gong, Princeton University, Princeton, NJ

Modeling of multiphysics crack growth in cement with peridynamic simulations
Jessica M. Rimsza, Sandia National Laboratories, Albuquerque, NM

Predicting field concrete strength using machine learning and hybridized datasets
Mikaela A. DeRousseau, University of Colorado Boulder, Boulder, CO

Understanding carbon uptake in calcium silicate hydrates
Siavash Zare, University of California Irvine, Irvine, CA

Long-term creep prediction of cement mortar using a thermo-rheological approach
Aishwarya Baranikumar, Civil Engineering, Texas A&M University, College Station, TX

Numerical simulation of the flow behavior of cementitious materials
Chuanyue Shen, University of Illinois at Urbana-Champaign, Urbana, IL

CONFERENCE SCHEDULE

TUESDAY, JUNE 18, 2019

ORAL PRESENTATIONS (12 minutes)
Q&A (3 minutes)

2:00 – 4:00 pm—Breakout Session #5a—NCEL 1310

ALTERNATIVE CEMENTITIOUS MATERIALS

Carbonation in alternative cementitious material systems: Implications on durability and mechanical properties

Prasanth Alapati, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA

No pressure: Accelerating carbonation curing

Peter Stynoski, US Army ERDC-CERL, Champaign, IL

Alkali-activation of fe-rich slag: Basic principles of an fe-silicate binder

Arne Peys, KU Leuven Department of Materials Engineering, Leuven, Belgium

Dissolution of crystalline slag phases in alkaline solution

Brian Traynor, Massachusetts Institute of Technology, Cambridge, MA

Evaluating the self-healing behavior of engineered cementitious materials incorporating the internal curing agent

Cihang Huang, Purdue University, West Lafayette, IN

New insights into supplementary cementitious material reactivity using pozzolanic testing and early-age cementitious paste testing

Sivakumar Ramanathan, University of Miami, Coral Gables, FL

Study of blended fly ashes in cement-based materials

Saif Al-Shmaisani, University of Texas at Austin, Austin, TX

Setting and nanostructure of slag-fly ash and slag-metakaolin binders

Kaushik Sankar, University of Illinois at Urbana-Champaign

2:00 – 4:00 pm—Breakout Session #5b—NCEL 2310

OPEN TOPIC

Nonlinear ultrasonic technique for monitoring early-stage material state in limestone cement concrete

Gun Kim, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL

Simultaneous neutron and x-ray tomography of unsaturated moisture flow in concrete

Laura E. Dalton, North Carolina State University, Raleigh, NC; Leidos Research Support Team, U.S. Department of Energy National Energy Technology Laboratory, Morgantown, WV

Self-Repair by Streaming Potential in Cements

Carolyn Dry, Designs by Natural Processes, Winona, MN

Understanding MICRO-seismic sources in geological and cement-based materials

Sai Kalyan Evani, University of Illinois at Urbana Champaign, Urbana, IL

Interaction between biomolecules and cementitious materials and their influence on the properties and microstructure of cementitious materials

Ali Ghahremaninezhad, University of Miami, Coral Gables, FL

Effect of sedimentation on the rheological properties of cement paste

Aida Margarita Ley-Hernandez, Missouri University of Science and Technology, Rolla, MO

Application of quantitative nanomechanical mapping for measurement of CNTs interaction with concrete

Raul E. Marrero, Northwestern University, Evanston, IL

4:15 – 5:00 pm

Award Ceremony

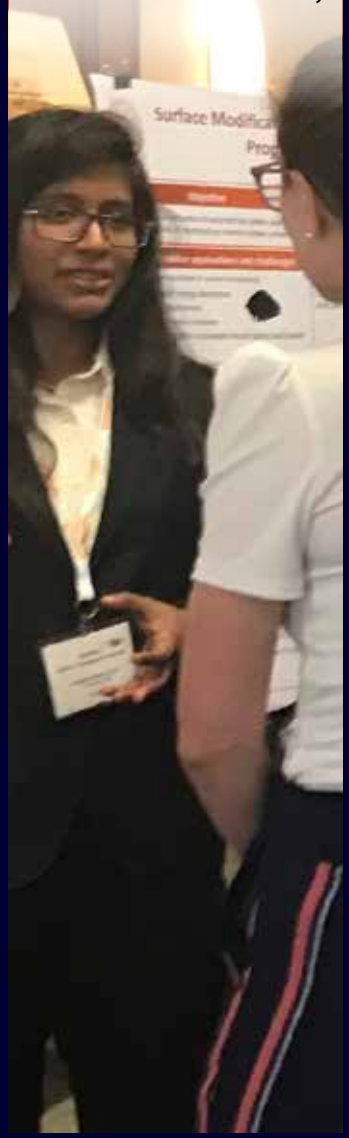
Program Chairs:

Matt D'Ambrosia
MJ2 Consulting

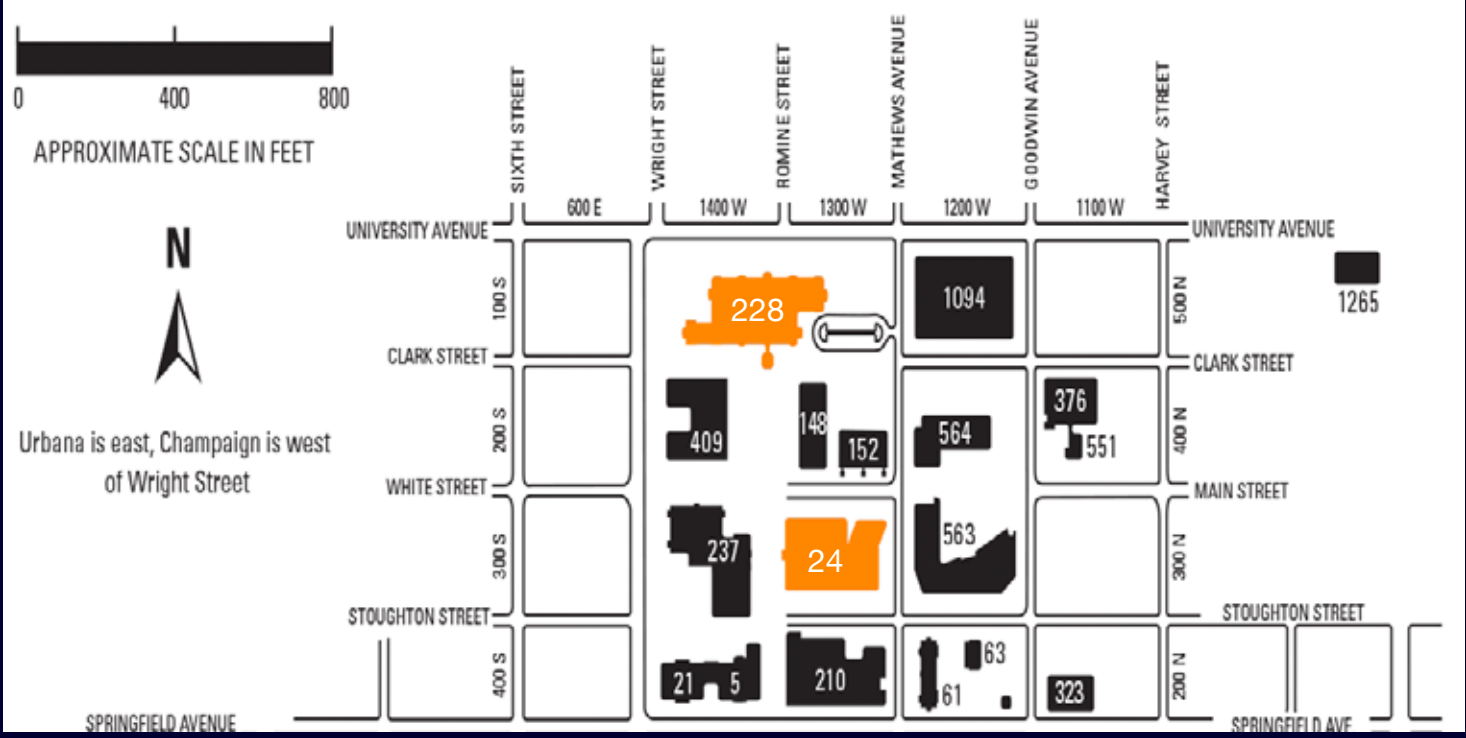
Nishant Garg
University of Illinois at Urbana-Champaign

ACerS Representative:

Erica Zimmerman
The American Ceramic Society



BUILDINGS:
24 (NCEL) and 228 (BECKMAN)



POSTER SESSION

Monday, June 17, 2019 | 5:30 – 7:00 pm | Beckman Atrium

POSTER SIZE 33.1 x 46.8 inches

P1– ***Developing a rational method to proportion cementitious mortars containing meta-kaolin for application in additive manufacturing***
Haripriya Nekkanti Ms, Clemson University, Clemson, SC

P2– ***Extrusion 3D-printing of marscrete and sulfur-based composites***
Matthew Troemner, Northwestern University, Evanston, IL

P3– ***Linking the rheological properties of cement-based printing paste to printability***
Babajide Y. Onanuga, Tennessee Technological University, Cookeville, TN

P4– ***Laboratory framework for understanding mix formulation for 3D printed cementitious materials***
Farzana Rahman, University of Texas at Austin, Austin, TX

P5– ***A comparison of gel-forming polymers for cement-based 3D printing pastes***
Hajar Taheri Afarani, Tennessee Technological University, Cookeville, TN

P6– ***Developing a standard reference material for (3D printable) concrete***
Karthik Pattaje S., University of Illinois at Urbana-Champaign, Urbana, IL

P7– ***Influence of silica-polyacrylamide hydrogel particles on the microstructure and mechanical properties of internally cured cement paste***
Baishakhi Bose, School of Materials Engineering, Purdue University, West Lafayette, IN

P8– ***Retarding mechanism of zinc compounds on cement hydration***
Deyu Kong, College of Civil Engineering & Architecture, Zhejiang University of Technology, Hangzhou, China

P9– ***Influence of metakaolin and montmorillonite on hydration of portland cement***
Jianqiang Wei, University of Massachusetts Lowell, Lowell, MA

P10– ***Influence of gravity on the hydration of C3a and gypsum systems***
Peter J. Collins, Pennsylvania State University, State College, PA

P11– ***Numerical simulation of the rheological behavior of concrete at fresh state***
Kavya Mendu, Northwestern University, Evanston, IL

P12– ***Dispersion optimization and characterization of CNTs/CNFs in cementitious composites***
Kavya Mendu, Northwestern University, Evanston, IL

P13– ***Kinetic analysis and thermodynamic simulation of alkali-silica reaction in cementitious materials***
Shuaicheng Guo, Michigan Technological University, Houghton, MI

P14– ***Comparative study of microwave and analytical characterization or alkali activated geopolymers and precursor materials***
Abu Naser Rashid Reza, South Dakota School of Mines and Technology, Rapid City, SD

P15– ***Kinetics of alkali-activated aluminosilicates***
Jennifer Mills, University of Delaware, Newark, DE

P16– ***The influence of cellulose nano-fibrils additions on the performance of cement paste and mortar***
Hosain Haddad Kolour, University of Maine, Orono, ME

P17– ***From nanosilica to dissolvable silica, an enable technique for large-scale application of nanosilica in concrete***
Jialai Wang, The University of Alabama, Tuscaloosa, AL

P18– ***Machine learning for high-factuality prediction and optimization of properties of cementitious system***
Taihao Han, Missouri University of Science and Technology, Rolla, MO

P19– ***Bio-inspired functionalization of cement with tannic acid for higher performance***
Yi Fang, The University of Alabama, Tuscaloosa, AL

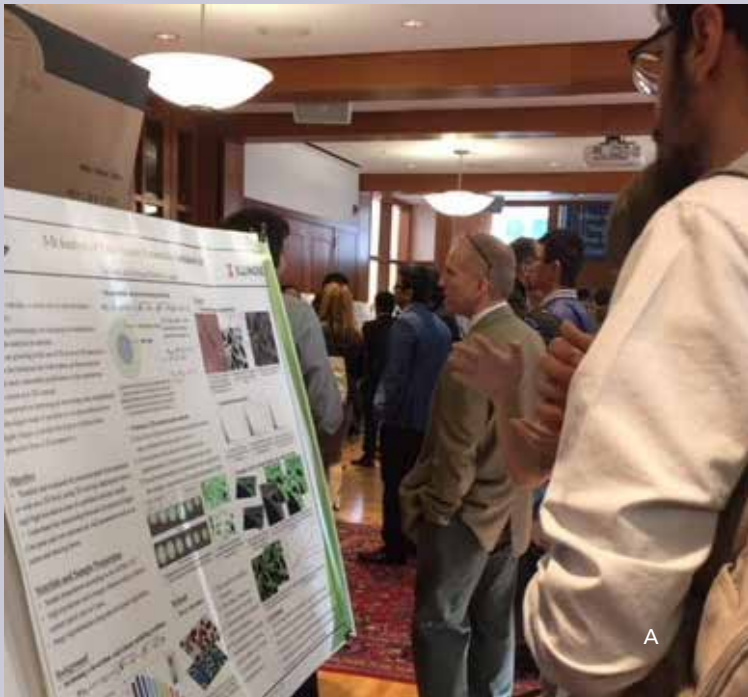
P20– ***Self-cleaning and NOx removal of photocatalytic cements***
Aniruddha Baral, University of Illinois at Urbana-Champaign, Urbana, IL

P21– ***Temperature and humidity effect on piezoelectric materials based electromechanical impedance (EMI) method for concrete properties monitoring***
Guangshuai Han, Purdue University, West Lafayette, IN

P22– ***A machine-learning based electromechanical impedance (EMI) method for concrete slab strength monitoring***
Yen-Fang Su, Purdue University, West Lafayette, IN

P23– ***Effects of microbially induced calcium carbonate precipitation on the properties of recycled concrete aggregates and its corresponding mortars***
Mimi Zhan, Northwestern University, Evanston, IL

P24– ***Developing of macro synthetic polypropylene (PP) fiber-reinforced rubber concrete***
Jiaqing Wang, Michigan Technological University, Houghton, MI



POSTER SESSION

Monday, June 17, 2019 | 5:30 – 7:00 pm | Beckman Atrium

POSTER SIZE 33.1 x 46.8 inches

P25– ***Mechanical property of foam concrete with recycled crumb rubber***
Robbie M. Damiani, University of Illinois at Urbana-Champaign, Urbana, IL

P26– ***Hydration, strength, and shrinkage of cementitious materials mixed with simulated desalination brine***
Nima Hosseinzadeh, University of Miami, Coral Gables, FL

P27– ***Two Methods for Internal Release of Anticorrosion Chemicals***
Carolyn Dry, Designs by Natural Processes, Winona, MN

P28– ***The transient effect of pressure on the rheology of air entrained cement paste and its dependence on the applied shear rate***
Daniel Galvez Moreno, Missouri University of Science and Technology, Rolla, MO

P29– ***Experimental studies on the effects of c & d waste as fine and coarse aggregates on the rheology of SCC***
Rajha Rajeswaran T. A., Velammal Engineering College, Chennai, India

P30– ***Effect of chemical admixtures and addition times on rheology of ultra-high performance concrete***
Megan Sarah Voss, University of Florida, Gainesville, FL

P31– ***Effect of mixing speed on the stability of phase change materials intermixed with cement paste***
Sarra Drissi, Key Laboratory for Green & Advanced Civil Engineering Materials and Application Technology of Hunan Province, College of Civil Engineering, Hunan University, Changsha, China

P32– ***Smart/multifunctional cementitious composites for sustainable infrastructures***
Zhen Li, Dalian University of Technology; Northwestern University, Evanston, IL

P33– ***Effects of reduced cementitious content for portland limestone cement concrete in Florida***
Hung-Wen Chung, University of Florida, Gainesville, FL

P34– ***Modelling the impact of chemical variability on the nano-structure ofiron-rich slags***
Christina Siakati, KU Leuven Department of Materials Engineering, Leuven, Belgium

P35– ***Evaluation of geopolymer mortar based on a binary blend of class f fly ash and ground glass fiber using a sodium silicate-free activator***
Omar Alsanusi Amer, Clemson University, Clemson, SC

P36– ***Production of calcium sulfoaluminate cements using waste materials***
Ogulcan Canbek, Georgia Institute of Technology, Atlanta, GA

P37– ***Tailoring slag chemistry to achieve superior resistance to sulfate attack for alkali-activated slags***
Kai Gong, Princeton University, Princeton, NJ

P38– ***Cationic stabilization of acid-resistant low-calcium alkali-activated cements***
Wil Srubar, University of Colorado Boulder, Boulder, CO

P39– ***Influence of nanoparticles on the gel structure of metakaolin-based geopolymers***
Christine Ann Pu, Princeton University, Princeton, NJ

P40– ***Properties enhancement of the rice husk ash (ASH) blended cementitious systems through improvements in the manufacturing and processing of RHA***
Harish Konduru, Clemson University, Clemson, SC

P41– ***Cow manure ash as a cementitious material***
Mohammed Albahttiti, California State University, Chico, Chico, CA

P42– ***Assessment of the hydration of portland cement with admixed corn ash using thermogravimetric analysis and isothermal calorimetry***
Mahmoud Shakouri, University of Nebraska at Kearney, Kearney, NE

P43– ***Effects of weathered fly ash composition on alkali silica reactivity***
Daniel J. Benkeser, Georgia Institute of Technology, Atlanta, GA

P44– ***Influence of the glass powder replacement on the atomic-structure, microstructure, and micromechanical properties of metakaoiln-based geopolymer***
Ruizhe Si, Michigan Technological Unviersity, Houghton, MI

P45– ***Calcium sulfoaluminate cement prehydration and its impacts on property development***
Sivakumar Ramanathan, University of Miami, Coral Gables

P46– ***Chloride transport and chloride binding in alkali-activated cement paste, mortar, and concrete***
Jorge Osio-Norgaard, University of Colorado Boulder, Boulder, CO

P47– ***Engineered living mortars: Structural hydrogel scaffolds that enhance microbial biocementation***
Sarah L. Williams, University of Colorado Boulder, Boulder, CO

P48– ***Influence of fine particles on properties of foam concrete***
Yu Song, University of Illinois at Urbana-Champaign, Urbana, IL

P49– ***NOX degradation efficiencies of photocatalytic cementitious systems with different surface topographies***
Richa Bhardwaj, University of Illinois at Urbana-Champaign, Urbana, IL

P50– ***Evaluation of hydration characteristics of fly ash-cement pastes using electrical resistivity method***
Yishun Liao, Wuhan University of Science and Technology, Wuhan, China; Iowa State University, Ames, IA

P51– ***Strategies for Delaying Calcium Sulfoaluminate (CSA) Cement Concrete Setting Time***
B. Cansu Acarturk, The Ohio State University

P52– ***Rheology of marscrete for 3D printing application***
Raúl E. Marrero, Northwestern University

P53 – ***Computationally generated concrete microstructures in simulated creep experiments***
Christa Torrence, Materials Science & Engineering, Texas A&M

P54 – ***Signal strength and performance of RFID sensors embedded in concrete***
Ruofei Zou, University of Illinois at Urbana-Champaign, Urbana, IL
University, College Station, TX