

## Poster Session

Sunday, July 10 | 5:00 - 7:00 p.m. | Norris Student Union

Monday, July 11 | 11:00 a.m. - 12:30 p.m. | Norris Student Union

- **The Effect of Reclaimed Asphalt Pavement on the Interfacial Transition Zone in Cementitious Composites**

*Alexander Brand and Jeffery Roesler*

- **Innovative Characterization of Portland Cement using X-ray Computed Tomography**

*Jamie Clark and David Lange*

- **Effects of Alkalies on Drying Shrinkage of Alkali-Activated Slag and Portland Cement**

*Hailong Ye and Aleksandra Radlinska*

- **Using Borosilicate Glass Powder for Mitigating Expansion Caused by Alkali Silica Reaction to Make Neutron Shielding Mortar**

*Bo Kil Jang, Ji-Hyun Kim, and Chul-Woo Chung*

- **Evaluation of Pozzolanic Activity on Dredged Sea Soil from Jangsang-po Harbor in Republic of Korea**

*Hoon Moon, Ji-Hyun Kim, Jae-Yong Lee, and Chul-Woo Chung*

- **Comparative Evaluation on Pozzolanic Activities of By-Product Waste Materials**

*Ik-Je Choi, Ji-Hyun Kim, Soo-Yong Lee, and Chul-Woo Chung*

- **Superabsorbent Hydrogels as Internal Curing Agents: investigating the Effects of Hydrogel Particle Size on Properties and Microstructure of Concrete**

*Austin Beggs, Matthew Krafcik, and Kendra Erk*

- **Effects of Polycarboxylate Superplasticizer Addition on Micro-Morphology of Hydration Products of Portland Cement Paste**

*Song Han, Mingzhe An, Peiyu Yan, and Kejin Wang*

- **Autogenous Healing of Hollow Concrete Pipes in Water Distribution Systems**

*Jeffryd Rose and Zachary Grasley*

- **Irreversible Shrinkage of Cement Paste Associated with Dissolution of Cement Grains**

*Xiaodan Li and Zachary Grasley*

- **The Use of Microfine Cement to Increase the Efficacy of Carbon Nanofibers in Portland Cement Mortar**

*Joshua Hogancamp and Zachary Grasley*

- **New Insight Into the Mechanisms Behind Drying Creep**

*Xiaodan Li and Zachary Grasley*

- **Rheology of Self Consolidating Concrete Reinforced with Synthetic Fibers**

*Abhishek Master, Chang Sun, and David Lange*

- **Direct Observation of the Transition Between the Induction and the Acceleration Period**

*Zhidong Zhang, Masoud Moradian, Qinang Hu, Mohammed Aboustait, Xianghui Xiao, Volker Rose, and Robert Winarski*

- **Elastic Wave Propagation in Concrete Caused by Scratch Excitation**

*Sai Kalyan Evani and John S. Popovics*

- **Investigation of the Mechanisms Underlying Crystalline Waterproofing**

*Seungmin Lim and Shiho Kawashima*

- **Chemical Composition Analysis of Alkali-glass Powder Reacted Gel**

*Shuaicheng Gui, Qingli Dai, and Xiao Sun*

- **Ultrasonic Scattering Measurement of Air Void Size Distribution in Early-age and Hardened Concrete Samples**

*Shuaicheng Guo, Qingli Dai, Xiao Sun, and Ye Sun*

- **Shear Transfer Behavior of Recycled Aggregate Concrete**

*Chang Sun, David Lange, and Jianzhuang Xiao*

- **X-ray Microtomography Based Method to Study Self-Healing in Cementitious Materials**

*Mo Li and Shuai Fan*

- **Alkali Silica Reaction Effects on Aging Mortar Bars**

*Madura Pathirage, Faysal Bousikhane, Kaijing Luo, and Gianluca Cusatis*

- **Development of Optimal Fiber-Reinforced Shotcrete Mixture Design for Use in Rock Wall Stabilization**

*Nicholas Claggett, Jeremy Feist, and Christopher Shearer*

- **Decay Behavior of Formwork Pressure Exerted by Self-Consolidating Concrete**

*Ang Li, Kavya Vallurupalli, and David Lange*

- **Effects of Pre-Soaked Light-Weight Aggregate on Deformation Properties of OPC-CSA Cement Blends**

*Ardavan Ardeshirilajimi and Paramita Mondal*

- **Influence of Nucleation Seeds on the Reaction Mechanism of Alkali-Activated Binders**

*Dipobrato Sarbapalli, Sravanthi Puligilla, and Paramita Mondal*

- **Modification of Crumb Rubber-Cement Interface and its Effect on Elastic and Viscoelastic Properties**

*Robbie Damiani and Paramita Mondal*

- **Resistance of Geopolymers to Saltwater Attack**

*Xiaonon Ge and Guoping Zhang*

- **Prospective Retarders for Alkali Activated Slag Systems: High pH Stability and Effect on Setting Time**

*Palash Badjatya and Paramita Mondal*

- **High Temperature Resistance of Calcium Silicate Cement Carbonated Concrete**

*Hyungu Jeong, Jan Olek, Jitendra Jain, and Sadananda Sahu*

- **Study of Sulfate Resistance of Carbonated Calcium Silicate Systems**

*Raikhan Tokpatayeva, Jan Olek, Jitendra Jain, and Sadananda Sahu*

- **Low-Lime Calcium Silicate Based Cement (CSC): Microscopic Phase Evolution, Reaction Kinetics, and Strength**

*Warda Ashraf, Jan Olek, Vahit Atakan, and Sadananda Sahu*

- **Damage in Concrete in Terms of Microscopic Density Changes**

*Pavitra Tejaswi Murru, Zachary Grasley, K.R. Rajagopal, and P. Alagappan*

- **Thermoelectric Concrete for Energy Harvesting in Civil Infrastructures**

*Ehsan Ghafari, Seyedali Ghahari, Luisa Castanho, Na Lu, and Yining Feng*

# 7th Advances in Cement-Based Materials CEMENTS 2016 July 10-13, 2016 Northwestern University Evanston, Illinois

Northwestern | McCORMICK SCHOOL OF ENGINEERING

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# 7<sup>TH</sup> Advances in Cement-Based Materials July 10-13, 2016

## Northwestern University - Evanston, Illinois, USA

**Sunday, July 10, 2016**

4:00 p.m. - 6:00 p.m. **Registration, Norris Lobby**  
5:00 p.m. - 7:00 p.m. **Student Reception, Norris Poster Session, Norris**

**Monday, July 11, 2016**

**9:00 a.m. - 11:00 a.m.**

### Session 1 | Mechanics | McCormick Auditorium

9:00 - 9:20 a.m. **Oilwell Cementing: Improving Compatibility between Cement Slurries & Synthetic-Based Drilling Muds**, K. Aughenbaugh, S. Nair, X. Liu, E. vanOort  
9:20 - 9:40 a.m. **Multiscale Fracture Assessment of Macro-Defect Free Cement via Advanced Scratch Testing**, K. Anderson, L. Struble, A. Akono  
9:40 - 10:00 a.m. **Mechanical Behaviors of Ultra-Low Density Foam Concrete Under Impact Loads**, Y. Song, R. Zou, D. Lange  
10:00 - 10:20 a.m. **Stress Relaxation Nanoindentation for Viscoelastic Properties of Calcium-(Alumino)-Silicate-Hydrate**, W. Hunnicutt, P. Mondal, L. Struble  
10:20 - 10:40 a.m. **Experimental and Computational Study on Concrete Permeability Increase Due to Cracking**, K. Luo, F. Bousikhane, G. Cusatis  
10:40 - 11:00 a.m. **Characterization of Early-Age Porosity and Indentation Moduli of Metakaolin and Slag Pastes**, N. Shanahan, A. Markandeya, A. Zayed

### Session 2 | Durability | 101 A Wildcat Room

9:00 - 9:20 a.m. **Chemical Profiling of Sulfate Deteriorated Concrete Samples Using Milli X-ray Fluorescence - X-ray Spectrum Imaging**, J. Hartell, M. Moradio, H. Donthineni  
9:20 - 9:40 a.m. **Do We Need Carbonic Acid for Carbonation? Atomistic Insight into Reaction Mechanisms Leading to Carbonates in Lime-Based Binders**, A. Funk, M. Abdolhosseini Qomi  
9:40 - 10:00 a.m. **Effect of Acidic, Sulfide-Contaminated Sands on the Performance of Cement-Based Materials**, A. Paul, M. Rashidi, K. Kurtis  
10:00 - 10:20 a.m. **Influence of Composition on the Swelling Properties of Alkali-Silica Reaction (ASR) Gels**, A. Vayghan, F. Rajabipour  
10:20 - 10:40 a.m. **Neutron Scattering Investigation of Water Dynamics in Hardened Cement Paste under Freeze-Thaw Cycles**, X. Sun, Q. Dai, S. Guo  
10:40 - 11:00 a.m. **Diffusion-Controlled and Creep-Mitigated ASR Damage in Concrete via Microplane Model**, S. Rahimi-Aghdam, Z. Bazant

### Session 3 | Dimensional Stability | 101 B Wildcat Room

9:00 - 9:20 a.m. **Creep and Relaxation of Early-Age Cement Paste Associated with Stress-Induced Dissolution of Hydrates**, X. Li, Z. Grasley, T. Ley, M. Moradian  
9:20 - 9:40 a.m. **Characterization of Hydration and Shrinkage for Oilwell Cementing Applications**, J. Thomas, S. Musso, J. Miller  
9:40 - 10:00 a.m. **The Creep Behavior of Composite Materials with High Temperature Effect**, L. Razdolsky  
10:00 - 10:20 a.m. **Drying of OPC Paste by Supercritical Fluids**, Z. Zhang, G. Scherer, A. Bauer  
10:20 - 10:40 a.m. **Multi-Year Model for Autogenous and Drying Shrinkage Interaction and Swelling in Water Based on Expansive Solid Skeleton During Hydration**, S. Rahimi-Aghdam, Z. Bazant, E. Masoero, M.J. Abdolhosseini Qomi  
10:40 - 11:00 a.m. **Internal Curing with Superabsorbent Poly(Sodium-Acrylate Acrylamide) Hydrogels and Influence on Void Structure and Hydration of Mortar**, M. Krafcik, K. Erk

**11:00 a.m. - 12:30 p.m.**

**Lunch | Starbucks Lounge | Lunch will be Provided**

**12:30 p.m. - 2:30 p.m.**

### Session 4 | Monitoring Sensing | McCormick Auditorium

12:30 - 12:50 p.m. **Impact of Nanoparticles on the Atomic Ordering of C-S-H and C-(N)-A-S-H Gels: New Insights from Synchrotron X-Rays**, N. Garg, C. White

12:50 - 1:10 p.m. **Layered Sensing Skin to Detect Cracking and Chlorides in Concrete Elements**, D. Smyl, M. Hallaji, A. Seppänen, M. Pour-Ghaz  
1:10 - 1:30 p.m. **In-Situ, Real-Time Measurement of Nanoscale Mineral Dissolution Rates using Digital Holographic Microscopy**, A. Brand, J. Bullard  
1:30 - 1:50 p.m. **Small-Angle Neutron Scattering and X-ray Computed Tomography Characterization of Alkali-Glass Particle Reacted Gels**, X. Sun, Q. Dai, S. Guo  
1:50 - 2:10 p.m. **Advanced Distributed Fiber Optic Sensor for Monitoring Cement Sheath in Oil and Gas Wells**, Q. Qu, S. Nair, M. Shuck, E. vanOort  
2:10 - 2:30 p.m. **Novel Method for the Quantification of Chlorides in Hydrated Cement Paste Using Micro X-ray Fluorescence**, P. Bran-Anleu, J. Davis, E. Pomjakushina, T. Wangler, R. Flatt

### Session 5 | Durability | 101 A Wildcat Room

12:30 - 12:50 p.m. **Are Concrete Strength and Toughness Affected by Alkali-Silica Reaction?** F. Bousikhane, K. Luo, M. D'Ambrosia  
12:50 - 1:10 p.m. **Effect of Alkali Cation Type on Structure of Alkali-Silica Reaction Gel**, M. Rashidi, A. Paul, K. Kurtis  
1:10 - 1:30 p.m. **Multiscale Analysis of Alkali Silica Reaction in Concrete: A Homogenization Approach**, R. Rezaghani, M. Alnaggar, G. Cusatis  
1:30 - 1:50 p.m. **Development and Performance of Rapid Repair Mortar**, G. Lomboy, K. Wang  
1:50 - 2:10 p.m. **A Multiscale Microstructure Model of Cement Paste**, P. Feng, J. Bullard  
2:10 - 2:30 p.m. **Evaluation of Carbonation in Alkali-Activated Slag Concrete with Different Activators**, S. Ghahramani, A. Radlinska

### Session 6 | Nanomaterials | 101 B Wildcat Room

12:30 - 12:50 p.m. **The Effect of Al-Zinc Oxide and Zinc Oxide Nanoparticles Addition on the Cement Paste Properties**, S. Ghahari, E. Ghafari, N. Lu  
12:50 - 1:10 p.m. **Increasing the Overall Dispersion of Carbon Nanofibers in Portland Cement Mortar by Utilizing a Smaller Grain Size Distribution and a Novel Dispersion Technique**, J. Hogancamp, Z. Grasley  
1:10 - 1:30 p.m. **Effects of Graphene Sulfonate nanosheets on Mechanical Properties of Cementitious Composites**, H. Chu, J. Jiang, W. Sun  
1:30 - 1:50 p.m. **Setting and Nanostructural Evolution of Metakaolin Geopolymer**, X. Chen, L. Struble  
1:50 - 2:10 p.m. **Properties of Cement Paste Incorporating Single Walled Carbon Nanotube Dispersed in Aqueous Suspension**, J. Kim, C. Chung  
2:10 - 2:30 p.m. **Experimental Investigation of Cementitious Materials Surface Treated by Electromigration Colloidal Nanosilica**, S. Shiyu, J. Jinyang, S. Wei

**3:00 p.m. - 5:00 p.m.**

### Session 7 | Imaging and Sensing | McCormick Auditorium

3:00 - 3:20 p.m. **Electromagnetic Imaging of Concrete Specimens with Various Moisture Contents**, Jo. Twumasi, V. Le, T. Yu  
3:20 - 3:40 p.m. **Microstructural Characterization of Blends of Volcanic Ash and Portland Cement Using Advanced Beamline Techniques**, K. Kupwade-Patil, A. Bumajdad, O. Buyukozturk  
3:40 - 4:00 p.m. **Determination of the Saturated Surface Dry Condition for Very Fine Particles using an Electrical Resistivity Method**, J. Kim, D. Lange, G. Zi  
4:00 - 4:20 p.m. **Quantitative Energy Dispersive X-ray Spectroscopy on Cement Paste**, J. Pacheco, O. Copuroglu  
4:20 - 4:40 p.m. **Spatial Damage Sensing within Multifunctional Cementitious Materials**, M. Li, X. Li  
4:40 - 5:00 p.m. **Measuring and Predicting Humidity and Temperature Inside Concrete Railroad Crossties**, D. Castaneda, K. Riding, D. Lange

### Session 8 | Durability | 101 A Wildcat Room

3:00 - 3:20 p.m. **Development of a Low-Temperature Calorimetry method to Quantify the Potential of Calcium Oxychloride Formation in Cementitious Materials**, Y. Farnam, J. Monical, E. Unal, J. Weiss  
3:20 - 3:40 p.m. **Carbonation of Pure Calcium Silicates: Understanding the Performance Controlling Factors of the Carbonate Binders**, W. Ashraf, J. Olek

3:40 - 4:00 p.m. **Calcium Oxychloride Formation in Concrete Pavements - Effect of Supplementary Cementitious Materials**, P. Suraneni, V. Azad, B. Isgor, J. Weiss  
4:00 - 4:20 p.m. **Passive Behaviour of New Alloy Corrosion Resistant Steel Cr10Mo1 in Simulating Concrete Pore Solutions with Different Chlorides Contents**, Z. Ai, J. Jiang, W. Sun  
4:20 - 4:40 p.m. **A New Kinetic Model to Quantify the Expansion Under Sulfate Attack**, Q. Zheng  
4:40 - 5:00 p.m. **Numerical Simulation of Freeze-Thaw Behavior of Cementitious Systems Containing Phase Change Materials**, H. S. Esmaeeli, Y. Farnam, P. D. Zavattieri, J. Weiss

### Session 9 | Hydration | 101 B Wildcat Room

3:00 - 3:20 p.m. **Application of General-Order Kinetics to Penetration Resistance for Stiffening Behavior of Fresh Cement-Based Materials**, C. H. Lee, K. Hoover  
3:20 - 3:40 p.m. **The Effect of Select Organic Compounds on Hydration of Portland Cement: Molecular Scale Insights**, O. Chaudhari, S. Northrup, J. Biernacki  
3:40 - 4:00 p.m. **Might Artificial Intelligence be an Opportunity for Cement Modelers?** J. Biernacki, D. Cruz, W. Eberle, D. Talbert  
4:00 - 4:20 p.m. **Whether Formation and Fracture of the Semi-Permeable Membranes Cause the Start and End of the Induction Period During C3S and Cement Hydration: A Novel Evidence**, D. Kong, P. Hou, D. Corr, S. Kawashima, W. Li, S. Shah  
4:20 - 4:40 p.m. **Understanding Silicate Hydration from Quantitative Analyses of Hydrating Tricalcium Silicate**, E. Pustovgar, R. Sangodkar, A. Andreev, M. Palacios, B. Chmelka, R. Flatt, J. d'Espinose de Lacaillerie  
4:40 - 5:00 p.m. **Direct Comparison of Measurements and Simulation of Cement Hydration**, J. Bullard, T. Ley, Q. Hu, J. Hagedorn, J. Terrill

**5:00 - 5:30 p.m. Business Meeting, McCormick Auditorium**

**5:30 - 6:30 p.m. DELLA ROY LECTURE, McCormick Auditorium**  
**Joe Biernacki, Tennessee Technological University**  
"What do Artificial Intelligence, Synthetic Life-Chemistry and Nuclear Fusion Have to do with Cement? (A Vision for Things to Come)"

**6:30 - 7:30 p.m. DELLA ROY RECEPTION**

(Sponsored by Elsevier)

**Tuesday, July 12, 2016**

**7:30 a.m. - 8:00 a.m. Check-In and Bus Departure to CTLGroup**  
**8:30 a.m. - 9:30 a.m. Breakfast and Refreshments at CTLGroup**

**9:30 a.m. - 12:00 p.m. Presentations at CTLGroup**  
**12:00 p.m. - 1:00 p.m. Lunch/Tour of CTLGroup**  
**1:00 p.m. - 2:00 p.m. Lunch/Tour of CTLGroup**  
**2:00 p.m. - 3:00 p.m. Buses Depart back to Northwestern**

**4:00 p.m. - 6:00 p.m. Professor Surendra Shah Symposium, Allen Center, McCormick Auditorium**  
**Dinner at Allen Center**  
**\* Tickets are Required**

**Wednesday, July 13, 2016**

**8:30 a.m. - 10:30 a.m.**

### Session 10 | Sustainable Materials | McCormick Auditorium

8:30 - 8:50 a.m. **The Use of Retarders to Control Setting and Slump Loss in Alkali-Activated Class C Fly Ash**, M. Juenger, W. Rakngan, T. Williamson, R. Ferron  
8:50 - 9:10 a.m. **Nucleation vs. Gelation: The Differences in the Reaction Mechanism of Hydroxide Activated and Silicate Activated Fly Ash-Slag Binders**, S. Puligilla, P. Mondal

9:10 - 9:30 a.m. **Short-Term Mineralogical Dynamics of Metakaolin-Based Alkali-Activated Cements**, J. Gevaudan, K.M. Campbell, R.K. Shoemaker  
9:30 - 9:50 a.m. **Experimental Studies and Analyses on the Role of Fibers and Recycled Aggregates in Enhancing the Durability and Sustainability of Concrete Structures**, T.A. Rajha Rajeswaran, A. Ravichandran, S. Kothandaraman  
9:50 - 10:10 a.m. **Effect of Admixture Chemistry on Hydration and Microstructure in MK-PLS Cement Systems**, B. Zaribaf, K. Kurtis  
10:10 - 10:30 a.m. **Predicting Aggregate Quality for Flexible Road Pavement with Bond Work Index**, O. Adigun, B. Adebayo, O. Amu

### Session 11 | Nanomaterials | 101 A Wildcat Room

8:30 - 8:50 a.m. **Carbon Nanotube Reinforced Concrete: Effect of Aspect Ratio and Functionalization on Strain and Damage Sensing**, M.S. Konsta-Gdoutos, P. Danoglidis, S.P. Shah  
8:50 - 9:10 a.m. **Applications of Thermally Conductive Concrete**, M. Tlustochowicz  
9:10 - 9:30 a.m. **Meso-Chemo-Mechanics of Calcium-Silicate-Hydrates**, M.J. Abdolhosseini Qomi, S. Masoumi  
9:30 - 9:50 a.m. **Effects of CNTs/CNFs on Shrinkage Cracking and Self-Curing Process in Cement Mortar**, Y. Gao, T. Shi, D. Corr, M. Konsta-Gdoutos, S. Shah  
9:50 - 10:10 a.m. **Nanosilica Coated Aggregates: Effects on Strength, Microstructure, and Transport Properties of Hydraulic Cement Mortars**, P. Panchmatia, R. Tokpatayeva, J. Olek, N. Lu

**11:00 a.m. - 1:00 p.m.**

### Session 12 | Rheology | McCormick Auditorium

11:00 - 11:20 a.m. **Plug Flow Correction for Shear-Thickening using the Modified Bingham Rheological Model in a Wide-Gap Rheometer**, D. Galvez-Moreno, A. Duran-Herrera, D. Feys  
11:20 - 11:40 a.m. **Effect of Low-Range and High-Range Water Reducers on the Microstructure of Hydrated Cement Paste**, A. Markandeya, A. Elnihum, T. Anisimova, N. Shanahan, A. Zayed  
11:40 - 12:00 p.m. **Hygro-Chemo-Thermo-Mechanical Modeling of Self-Weight Consolidation of Cementitious Materials**, S. Ghourchian, M. Wyrzykowski, P. Lura  
12:00 - 12:20 p.m. **A Correction Procedure to Characterize the Bottom Effect of a Rotary Cylinder During Tribological Measurements of the Lubrication Layer**, J. Vosahlik, D. Feys, K. Riding  
12:20 - 12:40 p.m. **Consequences of Dynamic Segregation of Self-Consolidating Concrete on In-Situ Properties of Pre-Stressed Beams**, A. Ley Hernandez, D. Feys, J. Hartell  
12:40 - 1:00 p.m. **Improved Rheological Properties of Geopolymer using Organic-Based Drilling Fluids**, X. Liu, D. Nair, K. Aughenbaugh, E. vanOort

### Session 13 | Transport Properties | 101 A Wildcat Room

11:00 - 11:15 a.m. **Visualizing Unsaturated Moisture Flow in Cement-Based Materials Using Electrical Methods**, D. Smyl, R. Rashetnia, A. Seppänen, M. Pour-Ghaz  
11:15 - 11:30 a.m. **Influence of Temperature on Fluid Absorption and Chlorid Ingress Behavior of Cement Based Materials**, J. Wei  
11:30 - 11:45 a.m. **Transport Properties in Cement Mortar - Challenges in Quantifying and Modeling**, J. Rose, Z. Grasley  
11:45 - 12:00 p.m. **Effect of Pore Solution Speciation and Disjoining Pressure on the Solid-Liquid Phase Transition: Implications on Freezing Deformation of Porous Media**, S. Rahman, Z. Grasley  
12:00 - 12:15 p.m. **Assessing Cement Pre-Hydration and Impact on Performance**, D. Silva, D. Kazmierczak  
12:15 - 12:30 p.m. **Introducing an FEM-GEM Framework for Reactive Transport Processes of Cementitious Systems**, V. Azad, O. Isgor  
12:30 - 12:45 p.m. **Direct Observation of the Transition Between the Induction and the Acceleration Period**, M. T. Ley, M. Moradian, Q. Hu, M. Aboustait, X. Xiao, V. Rose, R. Winarski