

SHIHO KAWASHIMA
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PROFESSIONAL INTERESTS

- Rheology of fresh cement-based systems and processing
- Characterization and development of cement-based systems modified with nanomaterials
- Use of by-products/waste in concrete to reduce carbon footprint

PROFESSIONAL EXPERIENCE

Northwestern University, Evanston, IL, USA	<i>July 2009 – Sept 2012</i>
Graduate Research Assistant, Structural Engineering and Materials	
Columbia University, New York, NY, USA	<i>Jan 2013 – Dec 2017</i>
Assistant Professor, Civil Engineering and Engineering Mechanics	
Columbia University, New York, NY, USA	<i>Jan 2018 – Present</i>
Associate Professor, Civil Engineering and Engineering Mechanics	

PROFESSIONAL PREPARATION

Columbia University, New York, NY, USA	<i>May 2008</i>
Bachelor of Science in Civil Engineering and Engineering Mechanics	
Northwestern University, Evanston, IL, USA	<i>Jan 2013 – Dec 2017</i>
Master of Science in Structural Engineering and Materials	
Northwestern University, Evanston, IL, USA	<i>Jan 2018 – Present</i>
Doctor of Philosophy in Structural Engineering and Materials	

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- Member, American Concrete Institute (ACI)
- Member, American Ceramics Society (ACerS)
- Member, American Society of Civil Engineers (ASCE)
- Member, Engineering Mechanics Institute (EMI)

AWARDS AND HONORS

- NSF CAREER Award, 2017
- Forbes' 30 under 30: Science, 2015

RESEARCH

ACCEPTED COMPETITIVE RESEARCH PROPOSALS

1. "Interaction of Admixtures and its Effect on the Evolution of Thixotropic Breakdown and Recovery of Cementitious Systems (ACI CRC #79)," (2014 – 2015). *Proposal to American Concrete Industry's Concrete Research Council. Accepted. (Total award: \$10,000)*

2. "Mitigating external corrosion of pipelines through nano-modified cement-based coatings (US DOT DTPH56-13-H-CAAP06)," (2013 – 2015). *Proposal to U.S. Department of Transportation Pipeline and Hazardous Materials Safety, Washington, D.C. Accepted. (Total award: \$135,774)*
3. "BRIGE: Characterizing the rheological and microstructural evolution of oil well cement slurries under elevated temperature and pressure conditions (NSF EEC-1342377)," (2013-2015). *Proposal to National Science Foundation, Arlington, VA. Accepted. (Total award: \$171,796)*
4. "Investigation of the mechanisms underlying crystalline waterproofing," (2015 – 2017). *Proposal to RPM Belgium & Vandex Group, Tielt, Belgium. Accepted. (Total award: \$220,175)*
5. "Functional Nano-fibers for Smart Concrete," (01/2017 – 06/2018). *Proposal for subaward to Konkuk University, Seoul, Korea (Project funded by CENIT Co., Ltd.) Accepted. (Total award: \$150,000)*
6. "CAREER: Tailoring Rheological Behavior and Interlayer Properties of 3-D Printing Concrete," (NSF 1653419), (06/2017 – 05/2022). *Proposal to National Science Foundation, Arlington, VA. Accepted. (Total award: \$500,000)*
7. "Innovative Techniques and Materials for Preventing Concrete Shrinkage Cracking," *Proposal for subaward to Rowan University, Glassboro, NJ (Project funded by New Jersey Department of Transportation, Trenton, NJ). Accepted. (Total award: \$100,000)*

ACCEPTED COMPETITIVE RESEARCH PROPOSALS (INTERNAL)

1. "Elucidating the contribution of thixotropy on the flow curve and critical shear rate of fresh cement mortars," (2015 – 2016). *Proposal to Provost's Grants Program for Junior Faculty, Columbia University, New York, NY. Accepted. (Total award: \$25,000)*
2. "Production of CO₂-negative concrete from seawater-derived raw materials," (09/2018 – 08/2019). *Proposal to SEAS Interdisciplinary Research Seed (SIRS) Program, Columbia University, New York, NY. Accepted. (Total award: \$80,000)*

REFEREED JOURNAL PUBLICATIONS (*CORRESPONDING AUTHOR)

1. **Kawashima, S.*** and S.P. Shah. "Early-age autogenous and drying shrinkage behavior of cellulose fiber-reinforced cementitious materials," *Cement and Concrete Composites*, 33(2): 201-208, 2011.
2. Gao, X., **S. Kawashima** and S.P. Shah. "Influence of clays on shrinkage and cracking tendency of SCC," *Cement and Concrete Composites*, 34(4): 478-485, 2012.
3. Hou, P., K. Wang, J. Qian, **S. Kawashima**, D. Kong, and S.P. Shah. "Effects of colloidal nanoSiO₂ on fly ash hydration," *Cement and Concrete Composites*, 34(10): 1095-1103, 2012.

4. **Kawashima, S.***, J-H. Kim, D. Corr and S.P. Shah. "Study of the mechanisms underlying the fresh-state response of cementitious materials modified with nanoclays," *Construction and Building Materials*, 36: 749-757, 2012.
5. Li, W., J. Xiao, Z. Sun, **S. Kawashima**, and S.P. Shah. "Interfacial transition zones in recycled aggregate concrete with different mixing approaches," *Construction and Building Materials*, 35: 1045-1055, 2012.
6. Hou P, D. Kong, **S. Kawashima**, J. Qian, D. Corr and S.P. Shah. "A novel evidence for the formation of semi-permeable membrane surrounding the Portland cement particles during the induction period." *Journal of Thermal Analysis and Calorimetry*: 1-4, 2012.
7. **Kawashima, S.***, P. Hou, D. Corr and S.P. Shah. "Modification of cement-based materials with nanoparticles," *Cement and Concrete Composites*, 36(0): 8-15, 2012.
8. Hou, P., **S. Kawashima**, K. Wang, D.Corr, J. Qian and S.P. Shah. "Effects of colloidal nanosilica on rheological and mechanical properties of fly ash-cement mortar," *Cement and Concrete Composites*, 35(1): 12-22, 2013.
9. Hou, P., **S. Kawashima**, D. Kong, D. Corr, J. Qian and S.P. Shah. "Modification effects of colloidal nanoSiO₂ on cement hydration and its gel property," *Composites Part B: Engineering*, 45(1): 440-448, 2013.
10. **Kawashima, S.***, J. Seo, D. Corr, M. Hersam and S.P. Shah. "Dispersion of CaCO₃ nanoparticles by sonication and surfactant treatment for application in fly ash-cement systems," *Materials and Structures*: 1-13, 2013.
11. **Kawashima, S.***, M. Chaouche, D. Corr and S.P. Shah. "Rate of thixotropic rebuilding of cement pastes modified with highly purified attapulgite clays," *Cement and Concrete Research*, 53(0): 112-118, 2013.
12. Fan, Y., S. Zhang, **S. Kawashima** and S.P. Shah. "Influence of kaolinite clay on the chloride diffusion property of cement-based materials," *Cement and Concrete Composites*, 45(0): 117-124, 2014.
13. Li, W.G., J.Z. Xiaoz, **S. Kawashima**, G.S. Shekhawat, and S.P. Shah. "Experimental investigation on quantitative nanomechanical properties of cement paste," *ACI Materials Journal*, 111: 1-6, 2014.
14. **Kawashima, S.***, M. Chaouche, D. Corr and S.P. Shah. "Influence of purified attapulgite clays on the adhesive properties of cement pastes as measured by the tack test," *Cement and Concrete Composites*, 48(0): 35-41, 2014.
15. Qian, Y., M. Abdallah, and **S. Kawashima***. "Characterization of Cement-Based Materials Modified with Graphene-Oxide." *Nanotechnology in Construction*. Springer International Publishing, 259-264, 2015.
16. Jang, S-H., **S.Kawashima**, and H. Yin. "Influence of carbon nanotube clustering on mechanical and electrical properties of cement pastes," *Materials*, 9(4): 220, 2016.
17. Li, W., **S. Kawashima**, J. Xiao, D. Corr, C. Shi and S.P. Shah. "Comparative investigation on nanomechanical properties of hardened cement paste," *Materials and Structures*, 49(5): 1591-1604, 2016.

18. Qian, Y. and **S. Kawashima***. "Flow onset of fresh mortars in rheometers: Contributions of paste deflocculation and sand particle migration," *Cement and Concrete Research*, 90: 97-103, 2016.
19. Qian, Y. and **S. Kawashima***. "Use of creep-recovery protocol to measure static yield stress of fresh cement pastes," *Cement and Concrete Research*, 90: 73-79, 2016.
20. Ma, S., T. Yu, M. Chaouche, Y. Wang and **S. Kawashima***. "Phase evolution of oil well cement slurries with nanoadditive at elevated temperature and pressure conditions," *ACI Materials Journal*, 113(5), 2016.
21. Jang, S.H., D.P. Hochstein, **S. Kawashima**, & H. Yin. "Experiments and micromechanical modeling of electrical conductivity of carbon nanotube/cement composites with moisture." *Cement and Concrete Composites*, 77: 49-59, 2017.
22. Kim, J-H., S.H. Kwon, **S. Kawashima**, H.J. Yim and M. Choi. "Rheology of cement-based materials under pumping pressure," *Cement and Concrete Composites*, 77: 60-67, 2017.
23. Ferraris, C.F., P. Billberg, R. Ferron, D. Feys, J. Hu, **S. Kawashima**, E. Koehler, M. Sonebi, J. Tanesi, and N. Tregger. "Role of Rheology in Achieving Successful Concrete Performance," *Concrete International*, 39(6): 43-51, 2017.
24. Qian, Y. and **S. Kawashima***. "Distinguishing dynamic and static yield stress of fresh cement mortars through thixotropy," *Cement and Concrete Composites*, 86: 288-96, 2018.
25. Ma, S., Y. Qian, and **S. Kawashima***. "Experimental and modeling study on the non-linear structural build-up of fresh cement pastes incorporating viscosity modifying admixtures," *Cement and Concrete Research*, 108: 1-9, 2018.
26. Lee, S., **S. Kawashima**, K. Kim, S-K. Woo, and J-P. Won. "Shrinkage characteristics and strength recovery of nanomaterials-cement composites," *Composite Structures*, 2018.
27. Lee, S., **S. Kawashima**, K. Kim, S-K. Woo, and J-P. Won. "Interfacial properties of nanosilica-treated structural polymer fibres in cement matrix composites," *Composite Structures*, 2018.
28. Ma, S., Y. Qian, and **S. Kawashima**. "Performance-based study on the rheological and hardened properties of blended cement mortars incorporating palygorskite clays and carbon nanotubes," *Construction and Building Materials*, 171: 663-671, 2018.
29. Guerini, V., A. Conforti, G. Plizzari, and **S. Kawashima**. "Influence of steel and macro-synthetic fibers on concrete properties," *Fibers*, 6(3), 47, 2018.
30. Marchon, D., **S. Kawashima**, H. Bessaies-Bey, S. Mantellato, and S. Ng. "Hydration and rheology control of concrete for digital fabrication: Potential admixtures and cement chemistry," *Cement and Concrete Research*, 2018.
31. Lim, S., H-S. Lee, and **S. Kawashima**. "Pore structure refinement of cement paste incorporating nanosilica: Study with dual beam scanning electron microscopy/focused ion beam (SEM/FIB)," *Materials Characterization*, 145: 323-328, 2018.
32. Lim, S., **S. Kawashima**. "Investigation of the Mechanisms underlying Crystalline Waterproofing through Microstructural and Phase Characterization," *Journal of Materials in Civil Engineering*, 2019 (In Press).

SELECT CONFERENCE PROCEEDINGS (*CORRESPONDING AUTHOR)

1. Shah, S.P., J.H. Kim and **S. Kawashima***. "Science and engineering for self-consolidating concrete," International RILEM Conference on Advances in Construction Materials through Science and Engineering, Hong Kong, China, September 5-7, 2011.
2. Shah, S.P., **S. Kawashima***, P. Hou and D. Corr. "Application of nanoparticles," 3rd International Symposium on Ultra-High Performance Concrete and Nanotechnology for High Performance Construction Materials, Kassel, Germany, Mar 7-9, 2012.
3. **Kawashima, S.***, M. Chaouche, D. Corr, and S.P. Shah. "Adhesive properties of nanoclay-modified cementitious materials," 5th North American Conference on the Design and Use of Self-Consolidating Concrete, Chicago, IL, May 12-15, 2013.
4. **Kawashima, S.***, M. Chaouche, D. Corr, and S.P. Shah. "Rate of rebuilding of cementitious materials with nanoclays," 5th North American Conference on the Design and Use of Self-Consolidating Concrete, Chicago, IL, May 12-15, 2013.
5. Ma, S. and **S. Kawashima***. "A study on the rheological behavior of cements modified with attapulgite clays under elevated temperature and pressure conditions," Fifth International Symposium on Nanotechnology in Construction, Chicago, IL, May 24-26, 2015
6. Ma, S. and **S. Kawashima***. "Microstructural evolution of oil well cement with nanoadditive at elevated temperatures and pressures," 14th International Congress on the Chemistry of Cement, Beijing, China, Oct 13-16, 2015.
7. Qian, Y. and **S. Kawashima***. "Investigating shear-induced particle migration in fresh cement mortars," RILEM International Symposium on Self-Compacting Concrete (SCC), Washington, D.C. USA, May 15-18, 2016.
8. Qian, Y. and **S. Kawashima***. "Use of thixotropy model to capture competition between paste deflocculation and sand particle migration," RILEM Materials, Systems and Structures in Civil Engineering, Lyngby, Denmark, Aug 21-24, 2016.
9. Ma, S. and **S. Kawashima***, "Rheological and water transport properties of cement pastes modified with viscosity modifying admixtures for 3D concrete printing," Proceedings of RILEM International Conference on Concrete and Digital Fabrication, Zurich, Switzerland, Sept 10 – 12, 2018.

INVITED TALKS

1. "Enhancing the fresh and hardened properties of concrete through the use of nanomaterials," Penn State University, University Park, PA, Apr 25, 2014
2. "Characterizing the thixotropy of cement-based systems," City College of CUNY, New York, NY, Feb 24, 2015
3. "Characterizing the thixotropy of cement-based systems," University of Southern California, Los Angeles, CA, Mar 3, 2015
4. "Characterizing the thixotropy of cement-based systems," University of Houston, Houston, TX, Feb 11, 2015

5. "Characterizing thixotropy of fresh cement-based systems modified with clays," Georgia Tech, Atlanta, GA, April 8, 2016.
6. "Characterizing thixotropy of fresh cement-based systems modified with clays," Ulsan National Institute of Science and Technology, Ulsan, South Korea, Sept 26, 2016.
7. "Characterizing thixotropy of fresh cement-based systems," Korea Electric Power Research Institute's International Workshop on Structural Life Management of Eco-Power Structures, Daejeon, South Korea, Sept 22, 2016.
8. "Characterizing thixotropy of fresh cement-based systems modified with clays," University of Michigan-Ann Arbor, Ann Arbor, MI, Nov 1, 2016.
9. "Characterizing thixotropy of fresh cement-based systems modified with clays," Purdue University, Geo-Institute Graduate Student Organization, West Lafayette, IN, Nov 2, 2016.
10. "Characterizing thixotropy of fresh cement-based systems modified with clays," California Institute of Technology, Pasadena, CA, Mar 9, 2017.
11. "Tailoring the rheological properties of cement-based systems for 3D concrete printing," University of Illinois at Urbana-Champaign, Champaign, IL, May 3, 2017.
12. "Tailoring the rheological properties of cement-based systems for 3D concrete printing," Northwestern University, Center for Sustainable Engineering of Geological and Infrastructure Materials (SEGIM), Evanston, IL, Oct 25, 2017.
13. "Utilizing admixtures to tailor the rheology of cement-based systems for extrusion-based 3D concrete printing," Purdue University, School of Civil Engineering, West Lafayette, IN, Apr 5, 2018.
14. "Utilizing admixtures to tailor the rheology of cement-based systems for extrusion-based 3D concrete printing," New Jersey Institute of Technology, Newark, NJ, Nov 19, 2018.
15. "Utilizing admixtures to tailor the rheology of cement-based systems for extrusion-based 3D concrete printing," Stevens Institute of Technology, Hoboken, NJ, Apr 2, 2019.

SERVICE

PROFESSIONAL

Professional Organization Committee Member

- ACI Committee 238 Workability of Fresh Concrete
- ACI Committee 238-A Student Workability
- ACI Committee 236 Material Science of Concrete
- ACI Committee 241 Material Science - Nanotechnology of Concrete
 - Subtask Group – Dispersion of Nanoparticles in Concrete Materials (Secretary)
- ACI Committee 564 3-D Printing with Cementitious Materials
- ACerS Cements Division (Secretary)

Conference Committee Member

- Conference co-chair, ASCE EMI Conference, New York, NY USA, 2020.

- International Advisory Board Member, '5th International Symposium on Ultra-High Performance Concrete and High Performance Construction Materials (HiPerMat),' Kassel, Germany, Mar 11 – 13, 2020.
- Scientific Committee Member, 'RILEM 2nd International Conference on Rheology and Processing of Construction Materials,' Dresden, Germany, Sept 8 – 11, 2019.
- Scientific Committee Member, 'RILEM International Conference on Concrete and Digital Fabrication,' Zurich, Switzerland, Sept 10 – 12, 2018.
- Scientific Committee Member, 'RILEM International Symposium on Self-Compacting Concrete (SCC),' Washington, D.C. USA, May 15- 18 2016.
- Program Committee Member, 'Fifth International Symposium on Nanotechnology in Construction (NICOM5),' Chicago, IL USA, May 24 – 26, 2015.

Associate Editor for Refereed Journals

- ASCE Journal of Materials in Civil Engineering
- ASTM International Advances in Civil Engineering Materials

Guest Reviewer for Refereed Journals

- *ACI Materials Journal*
- *Cement and Concrete Research*
- *Cement and Concrete Composites*
- *Applied Rheology*
- *Journal of Engineering Mechanics*
- *Journal of Materials in Civil Engineering*
- *Materials and Structures*
- *Construction and Building Materials*
- *Advances in Civil Engineering Materials*

Reviewer or Panelist for Grant Applications

- National Science Foundation, SBIR/STTR Phase I: Infrastructure
- National Science Foundation, CMMI Cementitious Materials Panel

TEACHING AND ADVISING

TEACHING EXPERIENCE

Term	Subject Number	Title	Role
2013y, 2014y, 2015y, 2016y, 2017y, 2018y, 2019y	ENME E3114	Experimental Mechanics of Materials	Lecturer
2013x, 2014x, 2015x, 2016x, 2017x, 2018x	CIEN E4201	Elastic and Plastic Structural Analysis	Lecturer

TEACHING EVALUATIONS

Term	# of Students	Course Evaluation	Instructor Evaluation
<i>ENME E3114 Experimental Mechanics of Materials</i>			
2014y	37	4.2/5	4.9/5
2015y	38	4.6/5	4.8/5
2016y	24	4.6/5	4.8/5
2017y	25	4.4/5	4.9/5
<i>CIEN E4201 Elastic and Plastic Structural Analysis</i>			
2013x	41	3.7/5	4.1/5
2014x	57	3.9/5	4.3/5
2015x	25	4.4/5	4.7/5
2016x	36	4.6/5	4.7/5
2017x	35	4.0/5	4.4/5

THESES SUPERVISED

M.S. Theses

1. Veronica Guerini, University of Brescia, Italy, *Workability and Mechanical Properties of Cementitious Materials Reinforced by Different Fiber Types*, Mar 2017 (Co-Advisor, Thesis committee member)
2. Yixi Tian, *Production of Structural Concrete from Waste to Energy Bottom Ash*, May 2018 (Co-Advisor, Thesis committee member)

Doctoral Theses, Supervisor

1. Ye Qian, *Characterization of Structural Rebuilding and Shear Migration in Cementitious Materials in Consideration of Thixotropy*, Oct 2016
2. Siwei Ma, *Physical, Chemical, and Mechanical Properties of Cementitious Materials with Rheological Modifiers*, Jun 2018

Doctoral Theses, As Reader (On Thesis Committee):

1. Benowitz, BA, *Modeling and Simulation of Random Processes and Fields in Civil Engineering and Engineering Mechanics*, 2013.
2. Wei, J, *Durability of Cement Composites Reinforced with Sisal Fiber*, 2014.
3. Jang, S-H, *Characterization and Modeling of Ferromagnetic Particulate Nanocomposites for Strain Sensing*, 2015.
4. Madeleine Lopeman, *Extreme Storm Surge Hazard Estimation and Windstorm Vulnerability Assessment for Quantitative Risk Analysis*, 2015.
5. Matthew Sloane, *Fire Effects on Suspension Bridge Main Cables: Methods for Determining Both Temperature and Strain Distributions Within an Exposed Cable*, 2016
6. Efe Karanci, *Modeling Corrosion in Suspension Bridge Main Cables*, 2017

7. Hwang Jung Geun, Civil Engineering and Engineering Mechanics, PhD proposal committee member, *In progress*
8. Lei Xu, Civil Engineering and Engineering Mechanics, PhD proposal committee member, *In progress*
9. Qiliang Lin, Civil Engineering and Engineering Mechanics, PhD proposal committee member, *In progress*
10. Mantas Atutis, *Analysis of Flexural Behaviour of Concrete Beams Prestressed with Basalt Fiber Reinforced Polymer Bars*, Vilnius Gediminas Technical University, 2018.

Current Research Group (students and postdoctoral associates who are in progress):

- Ala Eddin Douba, Sept 2017 – present, PhD Candidate
- Yixi Tian, Sept 2018 – present, PhD Candidate (co-advisor)
- Jithu Alexander, Sept 2018 – present, MS student
- Stephanie Berrios, Sept 2018 – present, MS student
- Sagar Suhas Nirgudk, Sept 2018 – present, MS student
- Jonathan Rosas, Jan 2019 – present, MS student
- Takuma Yonebashi, Jan 2019 – present, MS student
- Clare Chan, Sept 2018 – present, BS student
- Min Hwang, Jan 2019 – present, BS student
- Lin Ge, Jan 2019 – present, BS student
- Lorenzo Andres Ferrari, Jan 2019 – present, BS student

Postdoctoral Associates

<i>Name</i>	<i>Period of Stay</i>	<i>Current Position</i>
Sujin Lee	01/2016 – 07/2018	Postdoc, Columbia University
Seungmin Lim	08/2015 – 07/2017	Postdoc, Columbia University

Outreach Efforts

K-12:

Workshop Organizer, “Engineering Exploration Experience,” Society of Women Engineers, Local SEAS Chapter

2013 Present

Demo/lesson organizer, “Inside Engineering,” SEAS Outreach Programs

2016 Present

Undergraduate:

CEEM Department Representative, Columbia Engineering Women’s Forum, SEAS

2014, 2015, 2016

Graduate:

Speaker, Engineering Achievers in Graduate Education (EngAGE), SEAS

Mar 1, 2013

Program Co-organizer and Workshop Organizer, "Engineering and Applied Science," Johns Hopkins Center for Talented Youth (CTY) Program

Sept 20, 2014

Research advisor:

K-12:

- Iyin Tugbobo, Jun 2017 – Aug 2017, Present
- Augusta Uwamanzu-Nna, Jun 2015 – Sept 2015, Intel Science Talent Search 2016 Finalist

Undergraduate:

- Jumari Austin Robinson, B.S., May 2015 – Aug 2015, NSF Summer REU
- Maika Yzabelle Abdallah, B.S, Sept 2013 – Dec 2014, NSF Summer REU

Graduate:

- Andre Fuqua, M.S. student, Jan 2017 – May 2018
- Deborah Owolabi, B.S., M.S., Jan 2016 – Aug 2016, NSF SEGUE scholar
- Odanis Rosario, M.S., Jan 2014 – Aug 2014, NSF SEGUE scholar