NISHANT GARG

Postdoctoral Research Associate Princeton University Princeton, New Jersey, 08544, US Phone: +1 609 250 5395 Email: <u>nishantg@princeton.edu</u> Web: <u>scholar.princeton.edu/nishant garg</u>

CURRENT EMPLOYMENT

Princeton University, USJan 2016 – PresentPostdoctoral Research AssociateSupervisor: Prof. Claire WhiteDepartment: Civil and Environmental Engineering, Andlinger Center for Energy and the Environment

EDUCATION

PhD	Aarhus University, Denmark	2012 - 2015
	Major: Nanoscience	
	Supervisor: Prof. Jørgen Skibsted External Examiner: Prof. John Provis	
	Thesis title: Structure, reactivity, and dissolution of calcined clays	
	by solid-state NMR	
	GPA: 11.0/12.0	
MS	Iowa State University, US	2010 - 2012
	Major: Civil Engineering Materials	
	Supervisor: Prof. Kejin Wang External Examiner: Prof. Steve Martin	
	Thesis title: Raman spectroscopy for characterizing and determining	
	the pozzolanic reactivity of fly ashes	
	GPA: 3.91/4.00	
BE	Thapar University, India	2007 - 2010
	Major: Civil Engineering	
	GPA: 7.56/10.00	
Diploma	Chandigarh College of Engineering & Technology, India	2004 - 2007
	Major: Civil Engineering	
	GPA: 72.8/100.0 (Honors)	

RESEARCH EXPERIENCE

Postdoctoral research, Princeton University, US

2016 – Present

Involved in improving the durability of alkali-activated, sustainable cements by gaining a better understanding of their local atomic structure, primarily using synchrotron X-rays, in the group of Prof. Claire White affiliated with Department of Civil and Environment Engineering and the Andlinger Center for Energy and Environment.

Also involved in a project which focuses on improving the yield of the shale hydraulic fracturing process, in collaboration with Prof. Sankaran Sundaresan in the Department of Chemical and Biological Engineering.

PhD research, Aarhus University, Denmark

- Involved in the "SCM (Supplementary Cementitious Materials)" project in collaboration with Aalborg University, Aalborg Portland/Cementir Holding and FLSmidth, Denmark (Budget: \$5.25 million (USD), funded by Danish National Advanced Technology Foundation) in the group of Prof. Jørgen Skibsted.
- Applied solid-state NMR and other modern characterization tools (Inductively coupled plasma optical emission spectroscopy, scanning electron microscopy, X-ray diffraction) to understand the disordered structure, reactivity, and dissolution of heated clay minerals.

MS research, Iowa State University, US

- Involved in a project titled "Increasing Use of Fly Ash in Concrete through Nanomaterial Modification, Multi-scale Characterization, and Improved Processing" (Budget: \$0.45 million (USD), funded by Tennessee Valley Authority) under the supervision of Prof. Kejin Wang (PI) and Prof. Surendra P. Shah (Co-PI) in collaboration with Northwestern University, US.
- Applied Raman spectroscopy for characterizing and determining the pozzolanic reactivity of various fly ashes. Also optimized the mix design of semi-flowable self-consolidated concrete for Iowa pavements.

TEACHING AND MENTORING EXPERIENCE

Inc Lal Res Dej Aa	organic Chemistry o Instructor and Study Café Instructor (one semester) sponsible for lab sessions of two sections and grading lab reports. partment of Chemistry rhus University, Denmark	Fall 2014
De	sign of Portland Cement Concrete (CE 383)	Spring 2012, Fall 2011, Spring 2011
Tea Rea Dej Iov	aching Assistant (three semesters) sponsible for lab sessions and grading reports/homework of two sections partment of Civil, Construction, and Environmental Engineering va State University, US	each semester
En Pro Org Iov	Engineering 101 Project supervisor for final project of freshman engineering course, concrete materials section Organized a concrete strength competition for first year undergraduates Iowa State University, US	
Me	entoring Undergraduate Senior Thesis Projects	
	Princeton University, US Mentor for two senior year undergraduate students studying alkali-activ	ated cements 2016 – Present
	Iowa State University, US Mentor for a senior year undergraduate student studying fly ashes	2010 – 2011

2012 - 2015

2010 - 2012

JOURNAL PUBLICATIONS (Published)

- 1. Garg, N.; Wang, K.; "Comparing performance of different clays on fly ash modified mortars" *Journal of Sustainable Cement Based Materials*, 1:3, 111-125, **2012**.
- 2. Garg, N.; Wang, K.; Martin, S.W. "A Raman spectroscopic study of the evolution of sulfates and hydroxides in cement–fly ash pastes" *Cement and Concrete Research*, 53, 91-103, **2013**.
- 3. Wang, X., Wang, K., Li, J., **Garg, N.**, & Shah, S. P. "Properties of self-consolidating concrete containing high-volume supplementary cementitious materials and nano-limestone" *Journal of Sustainable Cement-Based Materials*, 3 (3-4), 245–255, **2014**.
- 4. Garg, N.; Skibsted, J.; "Thermal activation of a pure montmorillonite clay and its reactivity in cementitious systems" *Journal of Physical Chemistry C*, 118:21, 11464-11477, 2014.
- 5. Garg, N.; Wang, K.; "Estimating efficiency of fly ashes: an alternative definition of k values" *Journal of Sustainable Cement Based Materials*, 4, 25-33, 2015.
- 6. Garg, N.; Skibsted, J.; "Pozzolanic reactivity of a calcined interstratified illite/smectite (70/30) clay" *Cement and Concrete Research*, 79, 101-111, **2016**.

JOURNAL PUBLICATIONS (In preparation)

- 1. Garg, N.; Skibsted, J.; "Dissolution kinetics of calcined kaolinite and montmorillonite in alkaline conditions" *Manuscript in preparation*.
- 2. Garg, N.; White, C. E.; "Interactions between Zinc and Alkali-activated Materials" *Manuscript in preparation*.
- 3. Garg, N.; White, C. E.; "Impact of Alkali Ions on the Synthetic C-N-A-S-H Gel" Manuscript in preparation.
- 4. Garg, N.; White, C. E.; "Confined space synthesis of nano-sized aluminosilicates: Implications on fracking" *Manuscript in preparation*.

CONFERENCE PUBLICATIONS

- 1. **Garg, N.**; Wang, K.; "Applying Raman spectroscopy for studying cement-based materials" *Proceedings* of 2nd *International conference on Microdurability*, Amsterdam, Netherlands. April, **2012**. Published in "Microstructural-related Durability of Cementitious Composites" (RILEM Publications SARL) 2012, pp 275-282.
- 2. Wang, K.; Shah, S.; Wang, X.; Li, J.; **Garg, N.**; "Properties of self-consolidating concrete containing high volume supplementary cementitious materials and nano-limestone" *Proceedings of the 5th North American Conference on the Design and Use of Self-Consolidating Concrete*, Chicago, USA. May, **2013**.

- 3. **Garg, N.**; and Skibsted, J.; "Structure and reactivity of a thermally activated montmorillonite by solidstate NMR spectroscopy." *Proceedings of the 33rd Cement and Concrete Science Conference*, Portsmouth, UK. September, **2013**.
- 4. **Garg, N.**; and Skibsted, J.; "Structure and reactivity of a thermally activated smectitic clay by solid-state NMR." *Proceedings of the 1st International Conference on the Chemistry of Construction Materials,* Berlin, Germany. October, **2013**.
- 5. Skibsted, J.; Dai, Z.; Rasmussen, K. E.; Garg, N.; "Thermal Activation and Pozzolanic Reactivity of Calcined Clay Minerals for Applications in Portland Cement Blends" 19th Internationale Baustofftagung Ibausil, Weimar, Germany. September, 2015.
- 6. **Garg, N.**; Dai, Z.; Rasmussen, K. E.; Skibsted, J.; "Pozzolanic reactivity of thermally activated kaolinite and montmorillonite in Portland cement blends and their impact on the formed C-S-H phase" 14th *International Congress on the Chemistry of Cement*, Beijing, China. October, **2015**.

BOOK CHAPTERS AND REPORTS

Garg, N.; and Skibsted, J.; "Heated montmorillonite: Structure, reactivity, and dissolution" *Proceedings* of 1st international conference on Calcined Clay for Sustainable Concrete, Lausanne, Switzerland. June, 2015. Published as a chapter in "Calcined Clays for Sustainable Concrete" RILEM Bookseries Volume 10, 2015, pp 117-124.

CONFERENCE PRESENTATIONS

13)	Manipulating the Atomic Structure of Alkali-Activated Materials with Nanoparticles Garg, N.; White, C. E. Poster presentation, Gordon Research Conference Hong Kong University of Science and Technology, Hong Kong	2016
12)	Impact of Nanoparticles on the Atomic Ordering of C-(N)-A-S-H Gels: New Insights from Synchrotron X-rays Garg, N.; White, C. E. Oral presentation, Cements 2016 Meeting of American Ceramic Society Northwestern University, Illinois, US	2016
11)	Structure and Pozzolanic Reactivity of Calcined Clays in Portland Cement Blends from Solid-state NMR Spectroscopy Skibsted, J.; Garg, N.; Dai, Z.; Rasmussen, K. E. Oral presentation, 6 th Advances in Cement-Based Materials Kansas State University, Kansas, US	2015
10)	Pozzolanic Reactivity of Thermally Activated Kaolinite and Montmorillonite in Portland Cement Blends and their Impact on the Formed C-S-H Phase Garg, N.; Dai, Z.; Rasmussen, K. E.; <u>Skibsted, J.</u> Oral presentation, 14 th International Congress on the Chemistry of Cement Beijing, China	2015

9)	Thermal Activation and Pozzolanic Reactivity of Calcined Clay Minerals for Applications in Portland Cement Blends <u>Skibsted, J.</u> ; Dai, Z.; Rasmussen, K. E.; Garg, N. Oral presentation, 19 th Internationale Baustofftagung Ibausil Weimar, Germany	2015
8)	Heated Montmorillonite: Structure, Reactivity, and Dissolution Garg, N.; Skibsted, J. Oral presentation, 1 st International Conference on Calcined Clay for Sustainable Concrete Lausanne, Switzerland	2015
7)	Structure and Reactivity of a Heated Montmorillonite Clay Probed by ²⁹ Si and ²⁷ Al MAS NMR Spectroscopy <u>Garg, N.</u> ; Skibsted, J. Poster presentation, 56 th Annual Rocky Mountain Conference on Magnetic Resonance Colorado, US	2014
6)	Solid-state NMR Investigation of a Heated Clay* Garg, N.; Skibsted, J. Oral presentation, 35 th Danish NMR Meeting Skælskør, Denmark (*Won best student presentation award)	2014
5)	Structure and Reactivity of a Thermally Activated Smectitic Clay* Garg, N.; Skibsted, J. Poster presentation, International Conference on the Chemistry of Construction Materials Berlin, Germany (*Won 3 rd best poster award)	2013
4)	Structure and Reactivity of a Thermally Activated Montmorillonite by Solid-state NMR Spectroscopy, Garg, N.; Skibsted, J. Oral presentation, 33 rd Cement and Concrete Science Conference Portsmouth, UK	2013
3)	Activated Phyllosilicates for Replacement of Cement Garg, N.; Skibsted, J. Oral presentation, 34 th Danish NMR Meeting Aalborg, Denmark	2013
2)	Applying Raman Spectroscopy for Studying Cement-based Materials Garg, N.; <u>Wang, K.</u> Oral presentation, 2 nd International conference on Microdurability Amsterdam, Netherlands	2012
1)	<i>Using Raman Spectroscopy for Analyzing Fly Ashes</i> <u>Garg, N.;</u> Wang, K. Poster presentation, TVA-Kingston Fly Ash Release Environmental Research Symposium Tennessee, USA	2011

OTHER PRESENTATIONS

7)	Confined space synthesis of nano-sized aluminosilicates: Implications on fracking Garg, N.; White, C. E Poster presentation, Princeton E-ffiliates Partnership Fifth Annual Meeting Princeton University, New Jersey, USA	2016
6)	Alternative Cements: What and Why?* Garg, N. (*invited seminar) Oral presentation, Energy Seminars at Andlinger Center for Energy and the Environment Princeton University, New Jersey, USA	2016
5)	Calcined Clays for Sustainable Cements Garg, N. Oral presentation, Brown Bag Seminar at Department of Civil & Environmental Engineering Princeton University, New Jersey, USA	2016
4)	Impact of Nanoparticles on the Atomic Structure of Modern Cements Garg, N.; White, C. E Poster presentation, Andlinger Center Opening Symposium Princeton University, New Jersey, USA	2016
3)	Heated Clays for a Sustainable Future Garg, N.; Skibsted, J. Poster presentation, iNANO Autumn school, Grenå, Denmark	2014
2)	<i>Characterization of Thermally Activated Clay Minerals by Solid-state NMR</i> <u>Garg, N.;</u> Skibsted, J. Poster presentation, iNANO Autumn school, Grenå, Denmark	2012
1)	Raman Spectroscopy for Characterization of Fly Ashes* Garg, N.; Wang, K. Poster presentation, Annual Poster Presentation Competition at Department of CCEE Iowa State University, USA (*Won 2 nd best poster award)	2011

INDUSTRIAL EXPERIENCE

\triangleright	Quality Control Engineer
	Internship at a railway over-bridge construction site,
	STUP Consultants Pvt. Ltd., Punjab, India

Aug 2009 – Dec 2009

REVIEWER FOR ACADEMIC JOURNALS

- Cement and Concrete Research
- American Mineralogist
- Journal of Applied Crystallography
- > American Society of Civil Engineering: Journal of Materials in Civil Engineering
- Journal of Sustainable Cement-Based Materials
- > American Society for Testing and Materials: Advances in Civil Engineering Materials

ACADEMIC COMMUNITY INVOLVEMENT

American Chemical Society (ACS) Co-organizer of a session on cementitious materials in the Division of Geochemistry To be held in April, 2017 in San Francisco, California	
American Ceramic Society (ACerS) (Associate Member – Young Professional Network)	2016 – Present
American Concrete Institute (ACI) (Young Professional Member) Committee 236 - Material Science of Concrete: Member Committee 241 - Nanotechnology of Concrete: Member (Student Member)	2016 – Present 2012 – 2015
Clay Minerals Society (CMS), USA (Student Member)	2013 - 2015
American Society of Civil Engineers (ASCE) (Student Member)	2011 - 2015

BEAMTIME AWARDED AT MAJOR FACILITIES FROM COMPETITIVE PROPOSAL SYSTEM

Argonne National Lab 11-ID-B, Advanced Photon Source 72 hours of beam time awarded	Jul 2016
Argonne National Lab 11-ID-B, Advanced Photon Source 24 hours of beam time awarded	Dec 2016

AWARDS AND FELLOWSHIPS

6)	Conference Grant Registration and accommodation fee waived for the prestigious Gordon Research Conference Hong Kong University of Science and Technology, Hong Kong	2016
5)	Oral presentation award 1 st prize in Student Oral Presentation Competition at the 35 th Danish NMR Meeting, Skælskør, Denmark.	2014
4)	Poster presentation award 3 rd prize in Poster Competition at the 1 st International Conference on the Chemistry of Construction Materials, Berlin, Germany.	2013
3)	Poster presentation award 2 nd prize in Annual Poster Presentation Competition at Department of CCEE, Iowa State University, Iowa, USA	2011
2)	Eisenhower Fellowship Awarded Dwight David Eisenhower Transportation Fellowship of \$5,000 by US Federal Highway Administration.	2011
1)	Travel Grant Awarded travel grant for NSF-CMMI Research and Innovation Conference Atlanta, Georgia, USA	2011