

Ange-Therese Akono

Assistant Professor

Building Up Scholar

Department of Civil and Environmental Engineering

Department of Mechanical Engineering (Courtesy Appointment)

McCormick School of Engineering and Applied Science

Northwestern University, A132 Technological Institute

2145 Sheridan Road

Evanston, IL 60208-3109

Email: ange-therese.akono@northwestern.edu

Website: <https://sun-lab.org/>**EDUCATIONAL PREPARATION**

July 2013	Ph.D. in Civil and Environmental Engineering , <i>Massachusetts Institute of Technology</i> , Cambridge, MA, USA. Ph.D. Thesis: Assessment of Fracture Properties and Rate effects on Fracture of Materials by Micro Scratching: Application to Gas Shale. Supervisor: Dr. Franz-Josef Ulm.
Jan 2011	M. Sc. in Civil and Environmental Engineering , <i>Massachusetts Institute of Technology</i> , Cambridge, MA, USA. Master Thesis: Scratch Tests: A New Way of Evaluating the Fracture Toughness of Materials. Supervisor: Dr. Franz-Josef Ulm.
May 2011	Diplôme d'Ingénieur Polytechnicien , <i>Ecole Polytechnique</i> , Palaiseau, France.
May 2009	M. Sc. In Materials Design and Mechanics of Materials , <i>Ecole Polytechnique</i> , Palaiseau, France

PROFESSIONAL EXPERIENCE

Feb 2018 - Present	Affiliate Faculty , Department of Mechanical Engineering, <i>Northwestern University</i> , IL, USA.
Sep 2017- Present	Assistant Professor , Department of Civil and Environmental Engineering, <i>Northwestern University</i> , IL, USA.
July 2016- June 2017	Faculty Fellow , National Center for Supercomputing Applications <i>University of Illinois at Urbana-Champaign</i> , IL, USA.
Aug 2015-Aug 2017	Affiliate Faculty , Department of Mechanical Science and Engineering, <i>University of Illinois at Urbana-Champaign</i> , IL, USA.
Aug 2014-Aug 2017	Assistant Professor , Department of Civil and Environmental Engineering, <i>University of Illinois at Urbana-Champaign</i> , IL, USA.
Dec 2013-May 2014	Visiting Assistant Professor , Department of Civil and Environmental Engineering, <i>University of Illinois at Urbana-Champaign</i> , IL, USA.
Sep 2009- Nov 2013	Research Assistant , Department of Civil and Environmental Engineering, <i>Massachusetts Institute of Technology</i> , MA, USA.

HONORS AND AWARDS

Sept 2020	Building Up Scholar , National Institute for General Medical Sciences, USA.
June 2020	NIH Diversity Grant , National Institute of Clinical and Translational Sciences.
Aug 2019	Searle Faculty Fellowship , Northwestern University, USA.
Sept 2019	NUCATS KL2 Scholar , Northwestern University (offered, not accepted).
Sept 2019	NSF GOALI , National Science Foundation, USA.
Aug 2019	The Royal Society International Exchange Scheme Award , The Royal Society (UK's National Academy of Sciences), UK.
March 2019	The Royal Society's Speaker Invitation to Present at the Celebration of the 100 th anniversary of Griffith Work, The Royal Society, UK.
Oct 2017	Education Technology Teaching Fellowship , Northwestern University, USA.
Sept 2017	IGEN Keynote Speaker , Northwestern University, USA.
April 2016	NCSA Faculty Fellowship , National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, USA.
May 2016	BRIDGE Seed Fund Fellow , BiRmingham Illinois partnership for Illinois partnership for Discovery enGagement, and Education, University of Illinois at Urbana-Champaign, USA.
Feb 2016	New Faces of Civil Engineering- Professionals Honoree , American Society of Civil Engineers, USA.
May 2015	Collins Scholar Award 2014-2015 , College of Engineering—Academy for Excellence in Engineering Education, University of Illinois at Urbana-Champaign, USA.
Aug 2013	Certificate of Appreciation , Department of Civil and Environmental University, Howard University, USA.
April 2009	Total-MIT Energy Initiative Fellowship , Massachusetts Institute of Technology, USA.
April 2009	EGIDE Excellence Scholarship , Egide, France.
April 2007	Fondation de l'Ecole Polytechnique Excellence Fellowship , Ecole Polytechnique, France.
Nov 2004	President's Award for Educational Excellence , Ministry of National Education, Cameroon.

RESEARCH INTERESTS

- Nanomechanics: bottom-up modeling, elasticity and strength upscaling, statistical nanoindentation, scratch testing, machine learning.
- Smart materials: inorganic polymers, nanostructured ceramics, geopolymers, green concrete.
- Subsurface energy systems: unconventional resources, organic-rich shale, CO₂ geological storage, micro-induced seismicity.
- Biomaterials: cortical bone, hard biomineralized tissues, bone scaffolds.

INVENTIONS

- P1** **Ange-Therese Akono, Jiaxin Chen**, Carbon-fiber reinforced geopolymer composites, Patent Application, NU Attorney Docket Number: 00100-0235-PV, January 2021.
- P2.** **Ange-Therese Akono**, Smart photocatalytic and self-cleaning cement and method to synthesize the same, Provisional Patent Application, NU Attorney Docket Number: 00100-0253-PV May 2020.
- P3.** **Ange-Therese Akono, Jiaxin Chen**, Method to Synthesize Cement Reinforced with High Concentrations of Multiwalled Carbon Nanotubes and Carbon Nanofibers, Provisional Patent Application, NU Attorney Docket Number: 00100-0254-PV July 2020.
- P4** Ping Guo, **Ange-Therese Akono**, Multifunctional Enhanced-Toughness Hierarchical Organic-Inorganic Composites using Spatially-Resolved Electrospinning Methods, Provisional Patent Application, Sept 2020.
- P5.** **Ange-Therese Akono**, Method to Synthesize Cement Reinforced with Graphene Nanoplatelets at High Concentration Levels, Provisional Patent Application, Disc-ID-20-09-18-001, February 2021.

RESEARCH — PUBLICATIONS

Journal Articles in Preparation (N=6)

- J43** **Ange-Therese Akono**, Influence of Superplasticizer and Nanomaterial Functionalization on the Nanostructure of Cement Reinforced with Carbon Nanofibers and Carbon Nanotubes, *Nano Structures & Nano Objects*, In Preparation.
- J42** **Yunzhi Xu, Junior Ndayikengurukiye, Ange-Therese Akono**, Ping Guo, Electrospinning of organic fibers in an inorganic gel, *Manufacturing Letters*, In Preparation.
- J41** **Jiaxin Chen, Ange-Therese Akono**, Influence of multi-walled carbon nanotubes on the fresh and hardened properties of metakaolin-based potassium geopolymers at the microscopic lengthscale, *Journal of Materials Science*, In Preparation.
- J40.** **Ange-Therese Akono**, Saeed Rahimi Aghdam, **Yunzhi Xu**, Zdenek P Bazant, Influence of relative humidity on creep and fracture response of organic-rich shale, *Acta Geotechnica*, In Preparation.
- J39.** **Ange-Therese Akono**, Performance of geopolymer composites made with feldspathic solid solutions: micromechanics and microstructure, *Journal of Construction and Building Materials*, In Preparation.
- J38.** **Ange-Therese Akono**, Gianluca Cusatis, Influence of Martian Regolith Simulant on Microstructure and Mechanical Response of Martian Binders, *Journal of Materials Science*, In Preparation.

Journal Articles Under Review (N=2)

- J37.** Elie Kamseu, **Ange-Therese Akono**, Achile Nana, Rodrigue C. Kaze, Cristina Leonelli, Performance of geopolymer composites made with feldspathic solutions: micromechanics and microstructure, *Cement and Concrete Composites*, Under Review.
- J36.** Achille Nana, Jean Ngouné; Jean Noel Yankwa Djobo; Hervé Kouamo Tchakouté; Maria Chiara Bognozzi; Cristina Leonelli, **Ange-Therese Akono**, Elie Kamseu, Particles size and distribution on the improvement of the mechanical performance of high strength solid solution based inorganic polymer composites: A microstructural approach, *Cement and Concrete Composites*, Under Review.

Peer Reviewed Journal Articles Published (N=35)

- J35.** **Ange-Therese Akono**, Fracture Toughness of 1D/2D-nanoreinforced Cement via Scratch Testing, *Philosophical Transactions of The Royal Society*, Accepted.

- J34.** **Ange-Therese Akono**, Charles Werth, Zhuofan Shi, Kristian Jessen, Theodore T Tsotsis, CO₂-Induced Alterations of the Cohesive-Frictional Behavior of Mt. Simon Sandstone: A Poromechanical Model, *Minerals*, Vol. 11, pp. 38, (2021)
- J33.** Lin Han, Madura Pathirage, **Ange-Therese Akono**, Gianluca Cusatis, Lattice Discrete Particle Modeling of Size Effect in Slab Scratch Tests, *Journal of Applied Mechanics*, pp. 1–32, 2020.
- J32.** **Ange-Therese Akono**, Gabriela Davila, Jennifer Druhan, Zhuofan Shi, Kristian Jessen, Theodore Tsotsis, Influence of Geochemical Reactions on Long-Term Mechanical Response of Mt. Simon Sandstone, *International Journal of Greenhouse Gas Control*, Vol. 103, pp. 103183, (2020).
- J31.** **Ange-Therese Akono**, Jiaxin Chen, Mimi Zhan, Surendra P. Shah, Basic Creep and Fracture Response of Fine Recycled Aggregate Concrete, *Journal of Construction and Building Materials*, In Press,(2021).
- J30.** **Ange-Therese Akono**, Mimi Zhan, Jiaxin Chen, Surendra P Shah, Nanoporosity of Calcium-Silicate-Hydrates in Fine Recycled Concrete Aggregate Mortars, *Cement and Concrete Composites*, Vol. 115, pp. 103827–103841, (2021).
- J29.** **Ange-Therese Akono**, Nanostructure and Fracture Behavior of Carbon Nanofiber-Reinforced Cement using Nanoscale Depth-Sensing Methods, *Materials*, Vol. 13, pp. 3837–3855, (2020).
- J28.** Jiaxin Chen, **Ange-Therese Akono**, Influence of Multi-Walled Carbon Nanotubes on the Hydration Products of Ordinary Portland Cement Paste, *Cement and Concrete Research*, Vol. 137, pp. 106197–106209, (2020).
- J27.** **Ange-Therese Akono**, Fracture Behavior of Metakaolin-based Geopolymer Reinforced with Carbon Nanofibers, *International Journal of Ceramic Engineering and Science*, Vol. 2, pp. 234–242, (2020).
- J26.** **Ange-Therese Akono**, Effect of nano-TiO₂ on C–S–H phase distribution within Portland cement paste, *Journal of Materials Science*, Vol. 55, pp. 11106–11119, (2020).
- J25.** **Ange-Therese Akono**, Seid Koric, Waltraud M. Kriven, Influence of Pore Structure on the Strength Behavior of Geopolymer Composites, *Cement and Concrete Composites*, Vol. 104, pp. 103361, (2019).
- J24.** Samantha J. Fuchs, D. Nicholas Espinoza, Christina L. Lopano, **Ange-Therese Akono**, and Charles J. Werth, Geochemical and geomechanical alteration of Mount Simon reservoir rock by CO₂-saturated brine following carbon sequestration, *International Journal of Greenhouse Gas Control*, Vol. 88, pp. 251–260, (2019).
- J23.** **Ange-Therese Akono**, Jennifer L. Druhan, Gabriela Dávila, Theodore Tsotsis, Kristian Jessen, Samantha Fuchs, Dustin Crandall, Zhuofan Shi, Laura Dalton, Mary K. Tkach, Angela L. Goodman, Scott Frailey, Charles J. Werth, A Review of Geo-Chemical-Mechanical Impacts in Geological Carbon Storage Reservoirs, *Greenhouse Gases: Science and Technology*, DOI: 10.1002/ghg.1870, (2019).
- J22.** **Ange-Therese Akono**, Pooyan Kabir, Zhuofan Shi, Samantha Fuchs, Theodore Tsotsis, Kristian Jessen, Charles J Werth, Modeling CO₂-Induced Alterations in Mt. Simon Sandstone via Nanomechanics, *Rock Mechanics and Rock Engineering*, DOI: <https://doi.org/10.1007/s00603-018-1655-2>, (2018).
- J21.** **Ange-Therese Akono**, Pooyan Kabir, Influence of Geochemistry on Toughening Behavior of Organic-Rich Shale, *Acta Geotechnica*, <https://doi.org/10.1007/s11440-018-0715-9>, (2018).
- J20.** **Ange-Therese Akono**, Jiaxin Chen, S. Kaewunruen, Friction and Fracture Characteristics of Engineered Crumb-Rubber Concrete at Microscopic Lengthscale, *Journal of Construction and Building Materials*, Vol. 30, pp. 735–745, (2018).
- J19.** **Ange-Therese Akono**, Yue Cui, Amrita Kataruka, Kevin Anderson, Pooyan Kabir, Intrinsic Mechanical Properties of Calcium Aluminate Crystals via the Linear Comparison Composite Method coupled with Nano-Indentation, *Mechanics of Materials*, Vol. 118, pp. 74–84, (2018).
- J18.** Kevin Anderson, **Ange-Therese Akono**, Microstructure-Toughness Relationships in Calcium Aluminate Cement/Polymer Composites using Instrumented Scratch Testing, *Journal of Materials Science*, Vol. 52, pp. 13120–13132, (2017).
- J17.** Kavya Mendu, Amrita Kataruka, Jasmine Puthuvelil, **Ange-Therese Akono**, Fragility Assessment of Bovine Cortical Bone Using Scratch Tests, *Journal of Visualized Experiments*, DOI: 10.3791/56488, (2017).

- J16.** Pooyan Kabir, Franz-Josef Ulm, **Ange-Therese Akono**, Rate-Independent Fracture Toughness of Grey and Black Kerogen-Rich Shales, *Acta Geotechnica*, Vol. 12, pp. 1207–1227, (2017).
- J15.** **Ange-Therese Akono**, Franz-Josef Ulm, Microscopic Toughness of Viscous Solids via Scratching: From Amorphous Polymers to Gas Shale, *Journal of Nanomechanics and Micromechanics*, DOI: [https://doi.org/10.1061/\(ASCE\)NM.2153-5477.0000131](https://doi.org/10.1061/(ASCE)NM.2153-5477.0000131),(2017).
- J14.** **Ange-Therese Akono**, Letter to the Editor Reply to "Discussion on the Fracture mechanics interpretation of the scratch test by Akono *et al.*", *Engineering Fracture Mechanics*, Vol. 178, pp. 14–21, (2017).
- J13.** Caroline V. Johnson, Jiaxin Chen, Nicole P. Hasparyk, Paulo J. M. Monteiro, **Ange-Therese Akono**, Fracture properties of the alkali silicate gel using microscopic scratch testing, *Cement and Concrete Composites*, Vol. 79, pp. 71–75, (2017).
- J12.** Amrita Kataruka, Kavya Mendu, Orieka Okeoghene, Jasmine Puthuvelil, **Ange-Therese Akono**, Microscopic assessment of bone toughness using scratch tests, *Bone Reports*, Vol. 6, pp. 17–25, (2017).
- J11.** **Ange-Therese Akono**, Gregory Bouche, Shallow and Deep Scratch Tests as Powerful Alternatives to Assess the Fracture Properties of Quasi-Brittle Materials, *Engineering Fracture Mechanics*, Vol. 158, pp. 23–38, (2016).
- J10.** **Ange-Therese Akono**, Pooyan Kabir, Microscopic Fracture Characterization of Gas Shale via Scratch Testing, *Mechanics Research Communications*, (2016), Vol. 78, part B, pp. 86–92.
- J9.** **Ange-Therese Akono**, Energetic Size Effect Law at the Microscopic Scale: Application to Progressive-load Scratch Testing, *ASCE's Journal of Nanomechanics and Micromechanics*,(2016), DOI: 10.1061/(ASCE)NM.2153-5477.0000105.
- J8.** Gregory A. Bouche, **Ange-Therese Akono**, Micromechanics-based Lower Bounds on the Macroscopic Fracture Toughness of Micro-Particulate Composites, *Engineering Fracture Mechanics*, Vol. 148, pp. 243–257 (2015).
- J7.** Konrad J. Krakowiak, Jeffrey J. Thomas, Simone Musso, Simon James, **Ange-Therese Akono**, Franz-Josef Ulm, Nano-chemo-mechanical Signature of Conventional Oil-well Cement Systems: Effects of Elevated Temperature and Curing Time, *Cement Concrete Research*, Vol. 67, pp. 103–121, (2015).
- J6.** **Ange-Therese Akono**, Franz-Josef Ulm, Zdenek P. Bazant, Discussion: Strength-to-fracture scaling in scratching, *Engineering Fracture Mechanics*, Vol. 119, pp. 21–28, (2014).
- J5.** **Ange-Therese Akono**, Franz-Josef Ulm, An improved technique for characterizing the fracture toughness via scratch test experiments, *Wear*, Vol. 313, pp. 117–124, (2014).
- J4.** **Ange-Therese Akono**, Franz-Josef Ulm, Fracture scaling relations of axisymmetric shape, *Journal of the Mechanics and Physics of Solids*, Vol. 60, pages 379-390, (2012).
- J3.** **Ange-Therese Akono**, Nicholas X. Randall, Franz-Josef Ulm, Experimental determination of the fracture toughness via micro scratch tests: application to polymers, ceramics and metals, *Journal of Materials Research*, Vol. 27, pp. 485–493, (2012).
- J2.** **Ange-Therese Akono**, Pedro Miguel Reis and Franz-Josef Ulm, Scratching as a Fracture Process: From Butter to Steel, *Physical Review Letters*, Vol.106, pp. 204302–104305, (2011).
- J1.** **Ange-Therese Akono**, Franz-Josef Ulm, Scratch test model for the determination of fracture toughness, *Engineering Fracture Mechanics*, Vol. 78, pp. 334–342, (2011).

Chapters in Books

- BC3.** Sakdirat Kaewunruen, **Ange-Therese Akono**, Alex M. Remennikov, Attenuation Effect of Material Damping on Impact Vibration Responses of Railway Concrete Sleepers, *Sustainable Solutions for Railways and Transportation Engineering: Proceedings of the 2nd GeoMEast International Congress and Exhibition on Sustainable Civil Infrastructures*. El-Badawy, S. & Valentin, J. (eds.). Springer, Cham, pp. 98–107, (2018).
- BC2.** Pooyan Kabir, **Ange-Therese Akono**, Nano-Scale Characterization of Organic-Rich Shale Via Indentation Methods, *New frontiers in Oil and Gas Exploration*, edited by Congrui Jin, and Gianluca Cusatis, (Springer), (2016).
- BC1.** Franz-Josef Ulm, **Ange-Therese Akono**, Roland J.-M. Pellenq, Fracture Toughness Bottom-Up: Experiments and Simulations, in *Mechanics and Physics of Porous Solids: a tribute to Pr. Olivier Coussy*, Symposium on Mechanics and Physics of Porous Solids, Edited by the organizing committee, ISBN: 978-2-7208-2593-4, (2011).

Peer-Reviewed Conference Proceedings

- RC4.** **Ange-Therese Akono**, Theodore T. Tsotsis, Charles J. Werth, Alteration of the Fracture Behavior in Host Rock During CO₂ Geological Sequestration, 10th International Conference on Fracture Mechanics of Concrete and Concrete Structures, FraMCos-X, Bayonne, France, June 2019. DOI: 10.21012/FC10.235480.
- RC3.** Kaewunruen, S, Singh, M, **Akono, A-T** & Ishida, T 2017, Characteristics of sustainable concrete using crumb rubber integrated with carbon nanotubes. In the 15th East-Asia Pacific Conference on Structural Engineering and Construction. Tongji University, 15th East-Asia Pacific Conference on Structural Engineering and Construction, Xi'an, China, 11/10/17.
- RC2.** Kabir Pooyan, **Ange-Therese Akono**, Fluid-Rock Reactions in Mt. Simon Sandstone at Microscopic Length-Scale, ARMA 18–219, American Rock Mechanics Association, 52nd meeting, Seattle, June 2018.
- RC1.** Jeffrey Thomas, Simon James, J. Alberto Ortega, Simone Musso, Francois Auzerais, Konrad Krakowiak, **Ange-Therese Akono**, Franz-Joseph Ulm, Roland Pellenq, Fundamental Investigation of the Chemical and Mechanical Properties of High-Temperature Cured Oil-Well Cements, Offshore Technology Conference, 30 April-3 May, Houston, Texas, USA, (2012).

Conference Proceedings (N=41)

- C41.** **Ange-Therese Akono**, Gianluca Cusatis, Fracture Toughness of Martian Concrete using Scratch Testing, Society of Engineering Sciences Virtual Meeting, September 29 – October 1, 2020. DOI: <https://doi.org/10.26226/morressier.5f5f8e69aa777f8ba5bd6136>.
- C40.** **Ange-Therese Akono**, Influence of Residual Cement on Performance of Recycled Aggregate Concrete, Society of Engineering Sciences Virtual Meeting, September 29 – October 1, 2020. DOI: <https://doi.org/10.26226/morressier.5f5f8e69aa777f8ba5bd602d>.
- C39.** **Ange-Therese Akono**, Influence of Microparticles and Nanoparticles on the Mechanical Response of Nanostructured Inorganic Polymers, Society of Engineering Sciences Virtual Meeting, September 29 – October 1, 2020. DOI: <https://doi.org/10.26226/morressier.5f5f8e69aa777f8ba5bd6069>.
- C38.** Jiixin Chen, **Ange-Therese Akono**, Fracture Behavior Analysis of Multi-walled Carbon Nanotubes Reinforced Potassium-Geopolymer Composites at Microscopic Scale, Society of Engineering Sciences Virtual Meeting, September 29 – October 1, 2020. DOI: <https://doi.org/10.26226/morressier.5f5f8e69aa777f8ba5bd5f75>.

- C37.** Jiixin Chen, Ange-Therese Akono, Porosity Determination of Cement Nanocomposites Reinforced with Multiwalled Carbon Nanotubes, Society of Engineering Sciences Virtual Meeting, September 29 – October 1, 2020. DOI: <https://doi.org/10.26226/morressier.5f5f8e69aa777f8ba5bd5fff>.
- C36.** Fracture Behavior of Metakaolin-based Geopolymers Reinforced with Carbon Nanofibers, 44th International Conference & Expo on Advanced Ceramics and Composites, Daytona Beach, FL, January 2020.
- C35.** Influence of Pore Structure on Failure Behavior of Geopolymer Composites, 56th Annual Technical Meeting of the Society of Engineering Science, October 13– 15, 2019, Washington University
- C34.** Influence of Structural Disorder on Strength Response of Polysialate Composites, 56th Annual Technical Meeting of the Society of Engineering Science, October 13 – 15, 2019, Washington University.
- C33.** Fracture Assessment of Cortical Bone at Microscopic Length-scale, ASCE Engineering Mechanics Institute Technical Meeting, June 18 – June 21, 2019, California Institute of Technology.
- C32.** Size Effect Law for Microscopic Scratch Testing, ASCE Engineering Mechanics Institute Technical Meeting, June 18 – June 21, 2019, California Institute of Technology.
- C31.** Computational studies on the ductile-to-brittle transition during scratch testing, ASCE Engineering Mechanics Institute Technical Meeting, May 29– June 1, 2018, Massachusetts Institute of Technology
- C30.** Influence of Nanoporosity on Strength of Inorganic Polysialates: A Molecular Dynamics Study, 42nd International Conference & Expo on Advanced Ceramics and Composites, Daytona Beach, FL, January 21– 26, 2018.
- C29.** Strength Properties of Geopolymer Composites Using a Theoretical and Numerical Approach, 42nd International Conference & Expo on Advanced Ceramics and Composites, Daytona Beach, FL, January 2018
- C28.** Representative Elementary Volume Modeling of Geopolymer Composites, 14th US National Congress on Computational Mechanics, July 17 – July 20, 2017, Montreal.
- C27.** Fluid-Rock Reactions in Mt Simon Sandstone via Scratch Testing, 54th Annual Technical Meeting of the Society of Engineering Sciences, July 25 – July 28, 2017, Northeastern University.
- C26.** Ductile-to-Brittle Transition in Scratch Testing via the Energetic Size Effect Law: Macroscopic and Microscopic Length Scales, 54th Annual Technical Meeting of the Society of Engineering Sciences, July 25 – July 28, 2017, Northeastern University.
- C25.** Fracture Behavior of Geopolymer Concretes at the Microscopic Length-scale, 41st International Conference & Expo on Advanced Ceramics and Composites, January 22– January 27, 2017, Daytona Beach, FL.
- C24.** Investigation of the Mechanical Properties of Geopolymer Binders, ASCE Engineering Mechanics Institute, June 4 – June 7, 2017, Omni San Diego.
- C23.** Rate-Independent Fracture Toughness of Organic-Rich Shale, ASCE Engineering Mechanics Institute, June 4 – June 7, 2017, Omni San Diego.
- C22.** Strength Properties of Particulate Potassium-Based Geopolymer Composites: A Computational Study, ASCE Engineering Mechanics Institute, June 4 – June 7, 2017, Omni San Diego.
- C21.** Molecular dynamics study on the mechanical and fracture properties of geopolymer binders, 8th Advances in Cement-Based Materials, June 26 – June 28, 2017, Georgia Institute of Technology.
- C20.** Analytical and computational analysis of strength properties of geopolymer composites, 8th Advances in Cement-Based Materials, June 26 – June 28, 2017, Georgia Institute of Technology.
- C19.** Wear and strength characteristics of nano-engineered crumbed rubber concrete, 8th Advances in Cement-Based Materials, June 26 – June 28, 2017, Georgia Institute of Technology.
- C18.** Creep and Durability of Calcium Aluminate Cement – Polyvinyl Alcohol Composites Using the Transformation Field Analysis Method, ASCE EMI International, October 25 –October 27, 2016, Metz, France.
- C17.** Investigation of Bone Fragility at Microscopic Length Scales, ASCE Engineering Mechanics Institute Conference, May 22 –May 25, 2016, Vanderbilt University.
- C16.** Fracture Investigation of Organic Rich Shale: Microscopic to Macroscopic Scale, ASCE Engineering

- Mechanics Institute Conference, May 22 –May 25, 2016, Vanderbilt University.
- C15.** Fracture Mechanisms of Micro-particulate Composites via Microscopic Scratch Tests, ASCE Engineering Mechanics Institute Conference, May 22 –May 25, 2016, Vanderbilt University.
- C14.** Fracture mechanisms of microparticulate composites via macroscopic scratch testing, Fifteen Pan-American Congress of Applied Mechanics, May 18–May 21 2015, University of Illinois at Urbana-Champaign.
- C13.** Micromechanical Bounds on the Fracture Toughness of Silica-Reinforced Polymer Micro-Composites, ASCE Engineering Mechanics Institute Meeting, June 16 – June 19, 2015, Stanford University.
- C12.** Rate-Dependent Toughness in Soft Materials via Microscopic Scratch Testing, Applied Mechanics and Materials Conference, June 29 – July 1, 2015, Seattle.
- C11.** Fracture Resistance of Biological Tissues: A Theoretical and Experimental Study, 2nd HealthCare Engineering Systems Symposium, September 14, 2015, University of Illinois at Urbana-Champaign.
- C10.** Multiscale characterization of organo-cements using microscopic scratch tests and statistical nanoindentation, 6th Advances in Cement-Based Materials, July 20–July 22, Kansas State University, 2015.
- C9.** Rate-Dependent Toughness in Soft Materials via Microscopic Scratch Testing, Society of Engineering Sciences 51st Annual Technical Meeting, October 1 –October 3, 2014, Purdue University
- C8.** From Butter to Bone Tissues: Assessing the Fracture Resistance via Scratch Testing, Society of Engineering Sciences 51st Annual Technical Meeting, October 1 –October 3, 2014, Purdue University
- C7.** Scratching to Predict the Rate-Dependent Fracture of Creeping Materials, 17th U. S. National Congress on Theoretical and Applied Mechanics, Michigan State University, June 15 – June 20, 2014, Michigan State University.
- C6.** Fracture toughness prediction at the microscopic scale, Conference of the ASCE Engineering Mechanics Institute, August 4 – August 7, 2013, Northwestern University, Evanston, IL.
- C5.** Decoupling Creep and Fracture By Scratching, Conference of the ASCE Engineering Mechanics Institute, August 4 – August 7, 2013, Northwestern University, Evanston, IL.
- C4.** Scratch test as a fracture process: from soft to hard materials, American Physical Society, APS March Meeting 2012 Proceedings, February 27-March 2, 2012.
- C3.** Gas Shale as a Tool for Sustainability, Materials Research Society 2012 Fall Meeting, November 25–November 30, 2012, Boston.
- C2.** Scratch Tests: A New Way of Evaluating The Fracture Toughness of Materials, ASCE Engineering Mechanics Institute Conference, June 17 – June 20, 2012, University of Notre Dame.
- C1.** Scratch Tests as a Fracture Process: From Soft to Hard Materials, ASCE Engineering Mechanics Institute Conference, June 17 – June 20, 2012, University of Notre Dame.

SPONSORED RESEARCH PROJECTS

Awarded Research Projects (\$1.55M awarded in Extramural Funding)

- BIAM-NU Center for Multifunctional Enhanced-Toughness Hierarchical Organic-Inorganic Advanced Materials Composites using Spatially-Resolved Electrospinning Methods.** PI: Ange-Therese Akono, Co-PI: Ping Guo, \$100,000 (\$50,000 awarded to Dr. Akono)
 Manufacturing
 Sept 2020-Aug 2021
- National Institutes of Health NCATS Novel Geopolymer-based Bone Scaffolds for Bone Regeneration: bridging the Gap between Mesoporosity, High Mechanical Characteristics, and Enhanced Biocompatibility.** PI: Ange-Therese Akono, \$416,854.
 July 2020 – June 2022

Center for Hierarchical Design of Materials (CHiMaD)
Sept 2020–Aug 2023
Nanomechanical Investigation of Polymer Cellulose Nanocrystal Composites. Senior Personnel: Ange-Therese Akono, \$159,176. (\$200,000 awarded to Dr. Akono).

UK Royal Society International Exchange Scheme
Sept 2019– Sept 2021
Novel Inorganic Corrosion-Resistant Coatings for Improved Durability of Steel Rebars. PI: Samir Dirar, co-PI: Ange-Therese Akono, \$14,000. (\$7,000 awarded to Dr. Akono)

NSF DMR
July 2019–June 2022
GOALI: Investigation of Cyclic Failure in Aluminosilicate Nanocomposites. PI: Ange-Therese Akono. \$401,712 (\$401,712 awarded to Dr. Akono), co-PI: Brandon Frye. Ceramics, Division of Materials Research, National Science Foundation.

NSF CMMI
Aug 2017– July 2021
Strong and Multifunctional Inorganic Polysialate Composites: A Multiscale Study. PI: Ange-Therese Akono. \$350,525. Mechanics of Materials, Division of Civil Mechanical and Manufacturing Innovation, National Science Foundation.

DOE BES
Aug 2016–July 2019
Geological Sequestration of CO₂ center. Lead PI: Scott Frailey. Senior Personnel: Ange-Therese Akono. \$200,000 (\$200,000 awarded to Dr. Akono). Office of Basic Energy Sciences, US Department of Energy.

NCSA
July 2016 – June 2017
Multiscale and Multi-Physics Modeling of Na-PS Geopolymer Cement Composites. PI: Ange-Therese Akono. \$25,000 (\$25,000 awarded to Dr. Akono), co-PIs: Erman Guleryuz and Waltraud M. Kriven. National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign.

BRIDGE
May 2016– Dec 2016
Dynamic scratch resistance of micro- and nano-engineered concrete for sustainable and environmental-friendly applications in railway and other civil construction. PI: Sakdirat Kaewunruen, Co-PI: Ange-Therese Akono. \$8,000 (\$8,000 awarded to Dr. Akono). BiRmington Illinois partnership for Illinois partnership for Discovery enGagement, and Education Seed Fund.

Awarded Teaching Project

Murphy Northwestern University
Sept 2019-Aug 2021
Society, CEE 399: Special Topics in Nanoscale Engineering with Aim to Hold Nanoscience Outreach Workshops (CEE NOW). PI: Ange-Therese Akono, \$10,000

TEACHING

Northwestern University (Evanston, IL, USA)

Statics and Dynamics- EA II	GEN-ENG 205-3	Winter 2018, Winter 2020
Introduction to Elasticity	CIV 415	Spring 2018, Fall 2018
SPREE Seminar Series	CIV 512	Spring 2019, Fall 2019

The University of Illinois at Urbana-Champaign (Urbana, IL, USA)

Behavior of Materials	CEE 300	Spring 2014, Spring 2015
Structural Analysis	CEE 360	Spring 2016, Fall 2016, Spring 2017
Fatigue and Fracture	CEE 575	Fall 2015
Structural Engineering Seminar Series	CEE 595S	Spring 2015 – Spring 2017

SCIENCE OUTREACH

Northwestern University

- Oct 2019 STEM kids Story Time, OneBook, Northwestern University, Evanston, IL.
June 2018 Nanoscience, Waves, and Fun. In collaboration with Chicago Bulls College Prep, Chicago, IL, May 2018.

University of Illinois at Urbana-Champaign

- Aug 2017 Nanomechanics and Fun! In collaboration with the Illinois STEM Initiative and Urbana High School, Urbana, IL.
Feb 2017 Discover Engineering Girl Day.
Feb 2016 10th-grade Structural Mechanics Workshop. In collaboration with Intrinsic Schools, Chicago, IL.
Dec 2015 Mechanics of materials webinar. In collaboration with Intrinsic Schools, Chicago, IL.
Dec 2015 Strength of materials science lesson. In collaboration with Judah Christian School, Champaign, IL.
July 2014 Sustainability in construction materials. In collaboration with Urbana High School Tigers, Urbana, IL.

STUDENT ADVISING (3 Ph. D. Students, 6 M. Sc. Students, 15 Undergraduate students)

Northwestern University

Ph.D. Students

2. Yunzhi Xu, Northwestern University. Electrospinning of tough and nature-inspired inorganic polymer composites. Qualifying exam passed in June 2020. Tentative graduation date of May 2024.
1. Jiaxin Chen, Northwestern University. Nanomechanical studies of geopolymer materials. Qualifying exam passed in June 2019. Prospectus exam passed in November 2020. Defense planned for May 2021.

Undergraduate Students

5. Junior Ndayikengurukiye (Class of 2022). 3D printing of a robotic arm. Summer of 2020.
4. Mairi Glynn (Class of 2024). 3D printing of a robotic arm. Summer of 2020.
3. Raymonde Council (Class of 2024). 3D printing of a robotic arm. Summer of 2020.
2. Elyse Hebert (SROP scholar). Synthesis of soft hydrogels. Summer of 2018.
1. Devon Avery Dulan (Class of 2021). CO₂-induced alterations in mechanical properties of host rocks for geological carbon sequestration. Summer of 2018.

University of Illinois at Urbana-Champaign

Ph. D. Students

1. Pooyan Kabir. Geo-chemo-mechanical Modeling of Sedimentary Rocks: Application to Unconventional Reservoirs and Geological CO₂ sequestration. 2014- 2018 (graduated).

MS students

6. Radhika Pavghi. Synthesis of potassium-based geopolymer materials. December 2017.
5. Jiaxin Chen. Rubber-reinforced concrete for railway applications. May 2017.
4. Caroline Johnson. Multiscale characterization of alkali silicate gel for improved cement Durability. May 2017.
3. Okeoghene Orieka. Characterization of compact bone toughness via statistical nanoindentation. December 2017.
2. Kevin Anderson. Nanoscale characterization of the behavior of calcium aluminate cements-polyvinyl alcohol composites. May 2016.
1. Gregory A. Bouche. Investigation of the fracture toughness of sphere-reinforced polymer composites via scratch testing. May 2015.

Undergraduate Students

10. Anleen Cao (Class of 2018). Nanomechanical Studies of Mt Simon Sandstone for CO₂ subsurface sequestration. Spring 2017.
9. Matthew Figus (Class of 2017). Synthesis of Potassium-Based Geopolymer. Spring 2017.
8. Yihui Dong (Class of 2018). Characterization of Wear and Abrasion Properties of Recycled Rubber-reinforced concrete. Fall of 2016.
7. Luis Wally Chavez Quiroz (class of 2017). FEM modeling of granite-reinforced geopolymer using OOF2. Summer of 2016.
6. Jasmine Puthuvelil (class of 2017). Nanoscale Characterization of Cortical Bone. Spring 2016, Fall 2016, Spring 2017.
5. Kate Hawkins (class of 2016). Polishing procedures for the mechanical characterization of gas shale materials. Summer of 2015.
4. Suo Zhang (class of 2016). Manufacturing of organo-cements. Summer of 2015.
3. Ye Liu (class of 2015). Three-dimensional Schematic Representation of the Macroscopic Scratch Test Equipment. Summer of 2014.
2. Wenjing Li (class of 2016). Assessment of the fracture resistance of cortical bone specimens via scratch testing. Summer of 2014.
1. James C Myers (class of 2014). Fracture Properties of particle-reinforced paraffin wax specimens via Macroscopic Scratch Testing. Summer of 2014.

SERVICE AND LEADERSHIP

Conferences Organized/Co-Organized or Chaired/Co-Chaired

June 2021	ASCE Engineering Mechanics Institute International Meeting, Mini-symposium co-organizer, Advances in Computation, Theoretical and Experimental Fracture Mechanics, Virtual Conference
June 2019	ASCE Engineering Mechanics Institute International Meeting, Mini-symposium co-organizer, Advances in Computation, Theoretical and Experimental Fracture Mechanics, Pasadena USA, June 2019
Oct 2018	Society of Engineering Sciences 55 th Meeting, Mechanics of Biological Tissues and Biomaterials, Madrid, Spain,

June 2018	18 th National Congress on Theoretical and Applied Mechanics, Mini-symposium co-organizer, Mechanics and Physics of Multi-Scale Porous Media, Northwestern University
June 2018	ASCE Engineering Mechanics Institute International Meeting, Mini-symposium co-organizer, Advances in Computation, Theoretical and Experimental Fracture Mechanics, Cambridge USA
June 2017	ASCE Engineering Mechanics Institute International Meeting, Mini-symposium co-organizer, Advances in Computation, Theoretical and Experimental Fracture Mechanics, San Diego, USA
Jan 2018	42 nd International Conference and Expo on Advanced Ceramics and Composites, Mechanical Properties, Infrastructure, and Sustainable Materials, Daytona Beach, USA
Oct 2016	ASCE Engineering Mechanics Institute International Meeting, Mini-symposium co-organizer, Advances in Creep and Relaxation Mechanics, Metz, France
Oct 2016	Society of Engineering Science 53rd Meeting, Mini-symposium lead organizer, Mechanics of Inelastic Deformation and Failure in Biological Materials, Lafayette, IN
May 2016	ASCE Engineering Mechanics Institute 2016 Annual Meeting, Mini-symposium lead organizer, Advances in Experimental, Theoretical and Computational Fracture Mechanics, Vanderbilt, TN
Oct 2014	Society of Engineering Science 51st Meeting, Mini-symposium co-organizer, Fracture Processes in Biomineralized Tissues, Lafayette, IN

Membership in Professional Societies

2017-Present	US Association of Computational Mechanics
2016-Present	American Ceramic Society
2015-Present	Network of Minority Health Research Investigators (NMRI)
2012-Present	American Physical Society
2012-Present	Materials Research Society
2012-Present	American Society of Civil Engineers, Associate Member

Service in Technical Societies

American Society of Civil Engineers

Rock Mechanics Committee.

American Society of Civil Engineering Mechanics Institute

Architected Materials Committee Member, Biomechanics Committee Member, Modeling Inelasticity & Multiscale Behavior Committee Member, Nanomechanics and Micromechanics Committee Member.

Reviewer for Scientific Journals (N=57)

Journal of Rock Mechanics and Rock Engineering (7), Engineering Fracture Mechanics (6), Construction and Building Materials (6), Cement and Concrete Research (4), ASCE Journal of Nanomechanics and Micromechanics (4), Surface and Coatings Technology (3), Society of Petroleum Engineers Journal (2), Geotechnical Testing Journal (2), Mechanics Research Communications (2), Damage Mechanics (2), ASCE Journal of Materials in Civil Engineering (2), Composites Structures (2), Mechanics of Materials (1), International Journal of Rock Mechanics and Mining Sciences (1), Scientific Reports (1), International Journal of Solids and Structures (1), Wear (1), Wear

of Materials (1), Energies (1), Energy Exploration and Exploitation (1), Journal of Biomedical Materials Research Part A (1), Journal of the Mechanics and Physics of Solids (1), Polymer Testing (1), Sustainable and Resilient Infrastructure (1), ASCE Journal of Engineering Mechanics (1), Langmuir (1), Journal of Material Science and Engineering (1).

Reviewer for Grant Agencies (N=12)

National Science Foundation MOMS (3), National Science Foundation GEOMM (1), National Science Foundation CER (1), National Science Foundation SAEM (2), National Science Foundation FMRG (1), American Chemical Society Petroleum Research Fund (3), German Research Foundation (1).

Service at Northwestern University (Evanston, IL)

Winter 2018	NU CEE Mechanics Materials and Structures Admission Committee Member
Winter 2018	Theoretical and Applied Mechanics Admission Committee Member
Winter 2018 - Present	Diversity Fellowship Committee Member
Winter 2018 - Present	NU Central Laboratory for Materials Mechanical Properties Faculty Committee Member
Fall 2020 - Present	NU CEE GRE/Graduate Admission Committee

Service at the University of Illinois at Urbana-Champaign (Urbana, IL)

Jan 2015-Jan 2017	Faculty Advisor for the ASCE Engineer Without Borders student chapter
Spring 2014-2017	Structures Group Qualifying Exam Committee, CEE Department
Spring 2015	Structures Group Admission Committee, CEE Department
May 2015-2016	Women Exploring Graduate Opportunities in CEE, Organizing Committee Member

INVITED LECTURES (N=32)

-
32. Fracture at the Microscopic Lengthscale, Midwest Materials Surface Characterization Workshop, October 14, Evanston, IL
 31. Novel Strategies to Recycle Concrete using Nanotechnology and Data Science, Drexel University Department of Civil and Environmental Engineering, November 13, Philadelphia, PA, USA.
 30. Fracture Toughness of 1D/2D-nanoreinforced Cement via Scratch Testing, A cracking approach to inventing tough new materials: fracture stranger than friction, The Royal Society, London, UK, October 19 2020
 29. Effect of porosity on the mechanical response of geopolymer composites, 44th International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, Jan 2020
 28. The future of Engineering Education: Practitioners and Academics, Plenary Session, 2018 Structures Congress, Panel Speaker, Fort Worth, TX, Apr 2018
 27. Understanding Fracture at the Nanoscale: From Butter to CO₂ Geological Sequestration, Department of Civil and Environmental Engineering, University of Houston, Houston, TX, Apr 2018
 26. Nanomechanics Study of Fluid-Rock Reactions in Mt. Simon Sandstone, US DOE Energy Frontiers Research Centers Blue Team Meeting, Jan 2018
 25. Nanoscale Study of CO₂-induced Geo-chemo-mechanical Alterations for Geological Carbon Sequestration: Case Study of the Illinois Basin Decatur Project, Department of Civil and Environmental Engineering, Stanford University, Palo Alto, CA, Jan 2018

24. Influence of Nanoporosity on the Strength of Inorganic Polysialates: A Molecular Dynamics Study, 42nd International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, Jan 2018
23. Strength Properties of Geopolymer Composites Using a Theoretical and Numerical Approach, 41st International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, Jan 2018
22. Measuring the fragility of Cortical Bone via Microscopic Scratch Testing, Department of Biomedical Engineering, Northwestern University, Evanston, IL, Nov 2017
21. Graduate School - Pathway to Success and Empowerment, Introduction to Graduate Education at Northwestern University, Oct 2017
20. Upscaling the Strength Characteristics of Geopolymer Composites via Atomistic Simulations and Micromechanics Modelling, National Center for Supercomputing Applications, Urbana, IL, April 2017
19. Fluid-Rock Reactions in Mt Simon Sandstone via Scratch Testing, GSCO₂ Annual Review Meeting, Urbana, IL, March 2017
18. Fracture Behavior of Geopolymer Concretes at the Microscopic Length-scale, 42nd International Conference and Exposition on Advanced Ceramics and Composites, Daytona Beach, FL, January 2017
17. Hierarchically-Structured Porous Materials, Department of Civil and Environmental Engineering, Johns Hopkins University, Baltimore, MD, December 2016
16. Scratch resistance of nano-engineered crumbed rubber concrete for sustainable applications in civil construction, School of Engineering, University of Birmingham, (Birmingham, UK), July 2016
15. Multi-Physics Characterization of Reservoir rock: Microscopic to Macroscopic Scale, Illinois Prairie Institute, May 2016.
14. Nanomechanics of Hierarchically Structured Porous Materials: From Cortical Bone to Geopolymer Composites, Department of Civil and Environmental Engineering, Northwestern University, Evanston, IL Apr 2016
13. Exploration des Propriétés Mécaniques des Géo-matériaux à l'Echelle moléculaire, Laboratoire Navier, Ecole des Ponts- ParisTech (Paris, France), Nov 2015
12. Elucidating the Mechanical Resistance of Advanced Geo-composites at the Molecular Length-scale, Laboratoire de la Mécanique des Solides, Ecole Polytechnique (Palaiseau, France), Nov 2015
11. Elucidating the Mechanical Resistance of Advanced Geo-composites at the Molecular Length-scale, Department of Civil and Environmental Engineering, University of California, Los Angeles, Oct 2015
10. Multiscale characterization of organo-cements using microscopic scratch tests and statistical nano-indentation, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign, Sep 2015
9. Multiscale modeling of nano-degradation and self-healing in biological and geological materials, US Army Corps of Engineers Engineer Research & Development Center Construction Engineering Research Laboratory (CERL), IL, USA, May 2015
8. A Multi-scale Investigation of the Fracture Properties of Organic-inorganic Nanocomposites, Department of Civil and Environmental Engineering, Northwestern University, Evanston IL, USA, April 2015
7. As Tough As Iron: Gaining a Multiscale Understanding of Materials Fracture Resistance, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, USA, Oct. 2014
6. Multiscale Toughness: Cracking the Shell of Materials Risk to Fracture, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, USA, Sep 2014
5. Scratch Test: a New Approach For Multiscale Characterization of Fracture Properties, Department of Civil and Environmental Engineering, Howard University, Washington, DC, Oct 2013
4. Scratch Test: a New Approach For Multiscale Characterization of Fracture Properties, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, Dec 2012

3. Scratch Test: a New Approach For Multiscale Characterization of Fracture Properties, Department of Mechanical and Civil Engineering, California Institute of Technology, Pasadena, CA, Nov 2012
2. Scratch Test: a New Approach For Multiscale Characterization of Fracture Properties, Department of Civil Engineering and Engineering Mechanics, Columbia University, New York, NY, Oct 2012
1. Scratch Test: a New Approach For Multiscale Characterization of Fracture Properties, Department of Civil and Environmental Engineering, Stanford University, Palo Alto, CA, Feb 2012