

Sherif Aboubakr

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Raleigh, NC (Open to relocation on a global level) • Permanent Residency Applicant • 505-480-2572

Profile

Structural engineer experienced in advanced material development with 12+ years of high-intensity interdisciplinary research. Contributed to completing government research grants and private sector contracts valued at \$3+ million.

Education

Doctor of Philosophy in Civil Engineering (Structural Engineering and Mechanics) 2018-2022
North Carolina State University (NCSU), Raleigh, NC GPA: 3.78

Multifunctional structural materials via integration of optical fibers.
Advisors: Dr. Kara Peters, Dr. Jason Patrick.

Master of Science in Nanoscience and Microsystems w/Distinction 2013-2015
University of New Mexico (UNM), Albuquerque, NM GPA: 3.93

Mechanical characterization of mammalian cells-silica replicas.
Advisor: Dr. Mahmoud Reda Taha

Master of Science in Civil Engineering (Structural Engineering) w/Distinction 2010-2013
University of New Mexico (UNM), Albuquerque, NM GPA: 3.92

Epoxy-clay nanocomposite for carbon fiber reinforced polymer.
Advisor: Dr. Mahmoud Reda Taha

Bachelor of Science in Civil Engineering (Structural Analysis and Design)w/Honors 2003-2008
Alexandria University, Egypt GPA:84.76%

Research Experience

Graduate Research Scientist, Civil, Construction, Environmental Engineering & Mechanical & Aerospace Engineering Jan 2018-present

North Carolina State University (NCSU), Raleigh, NC

Experimentally testing the multiplexing fiber Bragg grating (FBG) sensors through an acoustic coupler to enable adaptive optical fiber sensor networks for structural health monitoring (SHM) for aluminum.

Formulated one-part photochemistry with excellent adhesion to epoxy, that polymerizes with visible light.

Developed a suitable microvascular and optical fiber system for targeted fluid/light delivery at the crack plane for integrated *in situ* damage self-detecting and self-healing of structural polymers.

Achieved *ex situ* self-sensing via spectroscopic tracking of photo-polymerization and correlation with mechanical recovery.

Achieved rapid, *in situ* self-healing orders of magnitude faster (100x) and at higher healing efficiency (78%) than the prior two-part system for structural polymers.

Performed thermal characterization of microvascular fiber composites.

Graduate Research Scientist, Orthopaedics, School of Medicine Jun 2016- Aug 2017

University of New Mexico-Health Sciences Center (UNMHSC), Albuquerque, NM

Awarded \$50,000 for Biodesign course, Innovation and commercialization award, UNM clinical and translational science center, and UNM school of engineering for developing a pelvic ring emergency stabilizing system (PRESS) for unstable pelvic fractures with access to the groin and the abdominal area without any removal or repositing of the belt.

Designed and built an open source, modular, and low-priced (< \$10,000) 3D bioprinter + electrospinner hybrid system for hierarchical, functionally graded scaffolds with high load-bearing characteristics for bone-ligament scaffold for regeneration (US. Patent Application No. 16/632,313. filed May 28, 2020).

Graduate Research Scientist, Center for Micro-Engineered Materials Aug 2015- Dec 2015

University of New Mexico (UNM), Albuquerque, NM

Performed mechanical characterization of cells-silica biocomposites generated by silicification and calcination of HeLa (CCL-2) and A549 (CCL-185) cancer cells using nanoindentation.

Graduate Research Scientist, Civil Engineering

Aug 2010- May 2016

University of New Mexico (UNM), Albuquerque, NM

Performed microstructural characterization and multiscale mechanical testing of epoxy and fiber reinforced polymers (FRP) composites incorporating MWCNTs, nanoclay, and nanorubber. My research enhanced the material's creep resistance, toughness, stiffness, and low-velocity impact.

Performed microstructural characterization of materials including recycled carbon black for producing carbon fiber, synthetic calcium-silicate-hydrate (CSH), cement paste incorporating ceramic waste powder, concrete incorporating nanoclay and nanosilica, and concrete exposed to fire & sulfate attack. Evaluated fresh and hardened concrete properties of sludge-based cement material.

Technical Skills

- Manufacturing: vacuum-assisted resin transfer molding (VARTM) process; vaporization of sacrificial components (VaSC) process; additive manufacturing (3D printing); electrospinning.
- Polymer mechanical testing: dynamic mechanical analysis (DMA); double lap shear; flexural; nanoindentation; tapered double cantilever beam (TDCB); tensile.
- Fiber composites mechanical testing: flexural; in-plane tensile; out-plane shear; low-velocity impact; mode I interlaminar fracture; pull-off strength/concrete; short-beam strength; volume fraction; Infrared thermography (IRT).
- Microstructural characterization: BET surface area analysis and BJH pore size and volume analysis; differential scanning calorimetry (DSC); scanning electron microscopy (SEM); transmission electron microscopy (TEM); solid-state ²⁹Si MAS- nuclear magnetic resonance (NMR) spectroscopy; thermogravimetric analysis (TGA); X-ray diffraction (XRD) analysis; Fourier-transform infrared (FTIR) spectroscopy; Raman spectroscopy.
- Cement and concrete properties measurements: Blaine fineness; air content; mortar flowability; setting time; pozzolanicity; compressive strength; splitting tensile strength; modulus of rupture.
- Fluid properties measurements: density; viscosity; contact angle; absorption spectrophotometry.
- Coding skills: Python; MATLAB.
- Computer skills: Abaqus; ANSYS; SAP2000; AutoCAD; SolidWorks; ImageJ, Kaleidagraph; Origin; Adobe Illustrator; LaTeX; MS Office.
- Language: Fluent in Egyptian Arabic, English.

Patent Application

- Salas, C., **Aboubakr, S.H.A.**, Nery, S., Buksa, C., Hamilton, A. (2020) Scaffolds for bone-soft tissue interface and methods of fabricating the same. U.S. Patent Application No. 16/632,313. filed May 28, 2020.

Journal Papers

- Aly, K., **Aboubakr, S. H.**, & Bradford, P. D. (2021). One-step fabrication of bulk nanocomposites reinforced by carbon nanotube array fragments. *Polymer Composites*, 43(1), 94-110.
- Pejman, R., **Aboubakr, S. H.**, Martin, W. H., Devi, U., Tan, M. H. Y., Patrick, J. F., & Najafi, A. R. (2019). Gradient-based hybrid topology/shape optimization of bioinspired microvascular composites. *International Journal of Heat and Mass Transfer*, 144, 118606.
- Salas, C., Howdieshell, T. R., Tufaro, R., Long, L., Mauser, A. K., Kondapi, A., & **Aboubakr, S. H.** (2018) Pelvic Ring Emergency Stabilization System (PRESS). *The University of New Mexico Orthopaedics Research Journal*, 7, 82-86.
- **Aboubakr, S. H.**, Nery, S., Long, L., Buksa, C. A., Fritch, C., & Salas, C. (2017) 3D bioprinter + electrospinner for bone-ligament tissue engineering. *The University of New Mexico Orthopaedics Research Journal*, 6, 110-116.
- Soliman, E. M., **Aboubakr, S. H.**, & Taha, M. M. R. (2017). Estimating fracture toughness of C-S-H using nanoindentation and the extended finite element method. *International Journal of Advances in Engineering Sciences and Applied Mathematics*, 9(3), 154-168.
- Kannan, D. M., **Aboubakr, S. H.**, EL-Dieb, A. S., Reda Taha, M. M. (2017). High performance concrete incorporating ceramic waste powder as large partial replacement of Portland cement. *Construction and Building Materials*, 144, 35-41.

- **Aboubakr, S. H.**, Begaye, M. L., Soliman, E., Reda Taha, M. M. (2016). Correlating microstructural features, elastic, and viscoelastic characteristics of synthetic CSH. ACI Special Publication, 312, 1-12.
- **Aboubakr, S. H.**, Kandil, U. F., Reda Taha, M. M. (2014). Creep of epoxy–clay nanocomposite adhesive at the FRP interface: A multi-scale investigation. International Journal of Adhesion and Adhesives, 54, 1-12.

Conference proceedings, posters, and presentations

- **Aboubakr, S.H.**, Martin, W.H., Patrick, J.F. (2020) Rapid Self-Healing of Structural Polymers via Integration of Microvasculature and Optical Waveguides. Poster on Gordon Research Conference on Multifunctional Materials and Structures, GRC, January 19 - 24, California, USA.
- Martin, W. H., **Aboubakr, S.H.**, Patrick, J. F. (2019) Towards self-healing and self-sensing using optical waveguides in microvascular composites. Presentation on 22nd International Conference on Composites Materials, ICCM 22, August 11-16, Melbourne, Australia.
- Martin, W. H., **Aboubakr, S.H.**, Patrick, J. F. (2019) Self-healing and progress towards self-sensing via optical waveguides in microvascular composites. Proceeding of 25th Conference on Structural Mechanics in Reactor Technology, SMiRT 25.
- Ali, S. M., El-Dieb, A. S., **Aboubakr, S. H.**, Reda Taha, M. M. (2016). Utilization of Ceramic Waste Powder in Self-Compacting Concrete. Proceeding of 4th International Conference on Sustainable Construction Materials and Technologies, SCMT4, S116.
- Rahman, M. K., **Aboubakr, S. H.**, Reda Taha, M. M. (2016). Nano-Characterization of Type-G Cement Slurry Incorporating Nanoclay Cured Under High Temperature and Pressure. Proceeding of 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures, IA-FraMCoS-09.
- **Aboubakr, S. H.**, Salas, C., Reda Taha, M. M. (2015). Low Velocity Impact Strength of CFRP Composites Incorporating Nanoclay. In American Society of Composites-30th Technical Conference. Proceedings of the American Society for Composites 2015 – 30th Technical Conference on Composite Materials, ASC 30th, pp. 2009-2018.
- **Aboubakr, S. H.**, Soliman, E. M., Reda Taha, M. M. (2015). Fracture Toughness of Synthetic CSH Using Nanoindentation. Proceedings of the 10th International Conference on Creep, Shrinkage, and Durability Mechanics, CONCREEP10, pp. 517-526.
- Borowski, E., **Aboubakr, S.**, Soliman, E., Reda Taha, M. M. (2014) Fracture Toughness of Carbon Fiber Laminates Including Carbon Nanotubes. Proceedings of the American Society for Composites 2014- 29th Technical Conference on Composite Materials, ASC 29th, pp. 603-612.
- Begaye, M. L., **Aboubakr, S. H.**, Kim, J. J., Reda Taha, M. M. (2013). NANO-CREEP of Synthetic CSH Produced using 1.5 and 0.7 CAO/SIO2 Mixture Ratios. Proceedings of the 9th International Conference on Creep, Shrinkage, and Durability Mechanics, CONCREEP 9, pp. 70-77.
- **Aboubakr, S.**, Kandil, U. F., Reda Taha, M. M. (2013). Creep of Epoxy-Clay Nanocomposite at the FRP Interface. Proceedings of the 9th International Conference of Composite Science and Technology, ICCST 9, pp. 791-801.

Teaching Experience

Graduate Teaching Assistant, Civil, Construction, Environmental Engineering (CCEE)

North Carolina State University (NCSU), Raleigh, NC

CE 214 Engineering Mechanics-Statics

Fall/Spring/Summer 2022/21

CE 214 CE 525 Structural Analysis II

Fall 2020

Graduate Teaching Assistant, Civil Engineering

University of New Mexico (UNM), Albuquerque, NM

CE 305 Infrastructure Materials Science

Fall 2013/14

Demonstrator/Teaching Assistant, Structural Engineering

Alexandria University, Egypt

CE 161/3, CE 264/5 Teaching Theory of Structures 1/2, 3/4

2008/09/10/17

Training/or Mentoring

- Sherif M. Daghsh, Graduate student, Department of Civil Engineering, UNM.
- Moneeb Genedy, Graduate student, Department of Civil Engineering, UNM.
- Michelle L. Begaye, Graduate student, Department of Civil Engineering, UNM.
- Rahulreddy Chennareddy, Graduate student, Department of Civil Engineering, UNM.
- Elisa Borowski, Graduate student, Department of Civil Engineering, UNM.
- Mojgan Maadandar, Graduate student, Department of Civil Engineering, UNM.
- Therese Martinez, Undergraduate student, Department of Mechanical Engineering, UNM.
- Ava Mauser, Undergraduate student, Department of Chemical and Biological Engineering, UNM.
- Nelly Erandy Nuñez Ontiveros, Undergraduate student, Innovation Academy for Women of the Americas at UNM.
- Sarah Mann, Post-Baccalaureate student, Research Internship Summer Experience (RISE) program, Department of Civil, Construction, and Environmental Engineering (CCEE), NCSU.
- Zach Phillips, Undergraduate student, RISE program, CCEE, NCSU.
- Yousef Abujaradeh, Undergraduate student, RISE, CCEE, NCSU.
- Urmi Devi, Graduate student, CCEE, NCSU.
- John Hinsley, Undergraduate student, RISE, CCEE, NCSU.
- Kevin Carney, Undergraduate student, RISE, CCEE, NCSU.

Professional Experience

Structural Engineer

Jun 2007- Sep 2009

Civil Engineering Consulting Office (CECO), Alexandria, Egypt

Extra-curricular Experience

President, Egyptian Student Association in North America (ESANA) NCSU chapter. Aug 2018- May 2019

President, Earthquake Engineering Research Institute (EERI) UNM chapter. Jan 2015- Aug 2017

Vice-president, The ONE Campaign at UNM. Jan 2014- Dec 2014

Awards and Honors

- Reviewer of Construction and Building Materials journal, Elsevier. Since 2017
- Abstract Reviewer of Frontiers in Resilience Symposium: Developing Innovative Resilience Solutions at the Interface of Science, Economics, and Policy, George Mason University, Arlington, VA 22201, May 10 – 11, 2017. 2017
- Biodesign course, Innovation and Commercialization award, UNM Clinical and Translational Science Center and UNM School of Engineering (50,000 \$). 2016
- Linda E. Jennett Endowed Fellowship, UNM. 2015
- Certificate of Professor Dr. Monir Kansoh of First in Hydraulics, Hydraulics and Irrigation Engineering Department, Alexandria University. 2007
- Alexandria University Appreciation award. 2005/6/7

Top 5 CliftonStrengths

- Ideation.
- Individualization.
- Achiever.
- Futuristic.
- Learner.

References

Kara Peters

Distinguished professor, Director of Graduate Programs, and Associate Department Head

Mechanical & aerospace engineering, North Carolina State University

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Arup K. Maji

Professor Emeritus (Former Chair & Interim Dean)

Civil engineering, The University of New Mexico

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Professor and Associate Head for Undergraduate Programs

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