MUJAN N. SEIF

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RESEARCH INTERESTS

My research interest lies in applying computational approaches to probe the intersection of nanoscale and mesoscale behavior of materials with complex, disordered, or inhomogeneous structure.

EDUCATION

University of Kentucky, Lexington, KYAugust 2018 - PresentPh.D. in Materials Science and EngineeringThesis Committee: Matthew J. Beck (Chair), T. John Balk, Alexandre Martin, Eric Stern (NASAAmes Research Center), Martin Kordesch (Ohio University)Ames Research Center)

University of Kentucky, Lexington, KY B.S. in Materials Science and Engineering Minors in Economics and Mathematics

HONORS AND DISTINCTIONS

CME Dept., University of Kentucky, 2022		
College of Engineering, University of Kentucky, 2021		
CME Dept., University of Kentucky, 2021		
Women's Forum, University of Kentucky, 2020		
The Graduate School, University of Kentucky, 2020		
CME Dept. Graduate Student Association, 2020		
International Vacuum Electronics Conference, 2020		
Space Technology Graduate Research Fellowship NASA, 2020		
The Graduate School, University of Kentucky, 2019		
Society of Women Engineers, 2019		
ion MACE, University of Kentucky, 2019		
National Science Foundation, 2019		
Society of Women Engineers, 2018		
ASM Bluegrass, 2017		
CME Dept., University of Kentucky, 2017		
CME Dept., University of Kentucky, 2016		
University of Kentucky, 2014		
University of Kentucky, 2012-2016		

PUBLICATIONS

In Press

- 2. M.N. Seif, Q. Zhou, X. Liu, T.J. Balk, M.J. Beck. "Sc-containing (Scandate) Thermionic Cathodes: Mechanisms for Sc Enhancement of Emission," *IEEE Transactions on Electron Devices*
- 1. M.N. Seif, Q. Zhou, X. Liu, T.J. Balk, M.J. Beck. "Sc-containing (Scandate) Thermionic Cathodes: Fabrication, Microstructure, and Emission Performance," *IEEE Transactions on Electron Devices*

May 2017

Refereed Journals

- M.N. Seif, D.J. Richardson, K.M. Moody, M. Martin, M. Turner, S.W. Mays, T.J. Balk, M.J. Beck. Stochastic approach for determining properties of randomly structured materials: Effects of network connectivity. *Acta Materialia* (2021): 117382. DOI: 10.1016/j.actamat.2021.117382
- M.N. Seif, M.J. Beck. Surface energies and equilibrium Wulff shapes in variable chemical environments at finite temperatures. *Applied Surface Science*, 540(2), 2021. DOI: 10.1016/j.apsusc.2020.148383
- M.N. Seif, T.J. Balk, M.J. Beck. Desorption from Hot Scandate Cathodes: Effects on Vacuum Device Interior Surfaces after Long-Term Operation. *Materials*, 13(22), 2020. DOI: 10.3390/ma13225149
- 1. M.N. Seif, M.J. Beck. Shape Memory Polymers: A Joint Chemical and Materials Engineering Hands-On Experience. *Chemical Engineering Education*, 52(1), 60-67, 2018.

Full Length Conference Proceedings

- 7. M.N. Seif, T.J. Balk, M.J. Beck. "Relative Thermodynamic Stabilities of Sc-containing Surface Configurations in Scandate Cathodes." IEEE International Vacuum Electronics Conference. IEEE, 2022.
- M.N. Seif, J. Puppo, M. Zlatinov, D. Schaffarzick, A. Martin, M.J. Beck. Stochastic mechanical modeling of Duocel foam from micro-to macro-length scales. In AIAA SCITECH 2022 Forum, 2022. DOI: 10.2514/6.2022-0627
- M. Ho, M.N. Seif, M.J. Beck, S. Leclaire, J. Trépanier, M. Reggio, A. Martin. "Fluid Behavior of Stochastic Porous Structures." 59th AIAA Aerospace Sciences Meeting, 2021. DOI: 10.2514/6.2021-1443
- S.M. McDaniel, M.N. Seif, M.J. Beck, A. Martin. "Development of Stochastic Model for Fibrous Ablator." 59th AIAA Aerospace Sciences Meeting, 2021. DOI: 10.2514/6.2021-1473
- M.N. Seif, S.M. McDaniel, M.J. Beck, A. Martin. "Stochastic Modeling of Elastic Behavior of Fibrous Ablators." 59th AIAA Aerospace Sciences Meeting, 2021. DOI: 10.2514/6.2021-1585
- M.N. Seif, T.J. Balk, M.J. Beck. "Temperature Effects on Desorption Behavior and Characteristic Wulff Shapes of Scandate Cathodes." IEEE International Vacuum Electronics Conference. IEEE, 2020. DOI: 10.1109/IVEC45766.2020.9520596
- M.N. Seif, B. Vancil, T.J. Balk, M.J. Beck. "Distribution of Desorption Products on Interior Surfaces of Scandate Cathode Test Vehicle." IEEE International Vacuum Electronics Conference. IEEE, 2020. DOI: 10.1109/IVEC45766.2020.9520573

Book Chapters

1. M.N. Seif. "My Life as a Brown Person." Arab Detroit 9/11: Life in the Terror Decade. Ed. N. Abraham, S. Howell, A. Shryock. Wayne State University Press, 2011. 213-220. Print.

GRANTS AND FELLOWSHIPS

Space Technology Graduate Research Fellowship Title: Modeling multi-scale material response of foam core sandwich panels for MMOD protection against hypervelocity impacts Agency: NASA Space Technology Graduate Research Opportunities (19-NSTGRO20-0207) Period: July 2020 (renewable up to 4 years) Amount: \$80,000/year (renewable up to 4 years)

2. Honorable Mention, NSF Graduate Research Fellowship Program Title: High-temperature dynamic surface chemistry of scandate cathodes Agency: XSEDE via NSF GRFP Honorable Mention (TG-MAT210028) Period: September 2021-present Amount: 1600 SUs (renewable yearly)

RESEARCH EXPERIENCE

Space Technology Graduate Research Fellow, NASAPresentGraduate Research Assistant, Beck Group, University of KentuckyPresentMaterial Response of Micrometeoroids and Orbital Debris (MMOD) ShieldingPresent

I use quantum-mechanical and finite-element calculations to study the material response of metallic foams in extreme conditions and subsequently generate improved inputs for NASA MMOD protection models.

Structure-Property Relationships in High Performance Dispenser Cathodes

I use quantum-mechanical calculations to investigate the thermodynamic and kinetic properties of highly-dynamic surfaces at high temperature.

Anisotropic Properties of Fibrous Carbon Ablators

I generate representative volumes of fibrous ablators for use in thermal protection systems and assess the anisotropy of their thermomechanical properties using finite element analysis.

Special Topic: 45th Aerospace Sciences Symposium, AIAA Day-Cin Section Mar. 2020

Special Topic: The Materials Project Workshop, University of California August 2018

Post-Baccalaureate, Thornton Group, *University of Michigan* Aug. 2017 - Apr. 2018 I used phase-field calculations to study the microstructural evolution of lanthanum strontium cobalt ferrite (LSCF) electrodes under their high temperature operating conditions in solid oxide fuel cells by iterating the Cahn-Hilliard equation to simulate coarsening via surface diffusion.

Special Topic: Integrated Comp. Materials Education, University of Michi	gan June 2017
Undergraduate Research Assistant, Beck Group, University of Kentucky	y Jan Aug. 2017
Undergraduate Research Asst., Balk Group, University of Kentucky	Jan. 2016 - Aug. 2017
Associate Investigator, DuPont Titanium Technologies	Jan Dec. 2014

TEACHING EXPERIENCE

MSE 301: Materials Science II

I am an official instructor of record for this course.

MSE 301: Materials Science II

I taught several weeks of this course while the course instructor was tending to a family emergency in China. I gave lectures focusing on electrical and magnetic properties of materials as well as semiconductor materials and devices.

Jan. - Feb. 2020

Jan. - April 2022

MSE 202: Materials Science Laboratory

I served as a teaching assistant for this highly hands-on course for sophomores in materials engineering. I introduced students to casting, polymerization, mechanical testing, and metallography.

Miscellaneous Lectures

During my graduate studies, I have served as a substitute lecturer for course instructors who could not attend their classes due to travel, illness, etc. I have given lectures in the following courses:

MSE 402: Electronic Materials and Devices
MSE 401: Metals and Alloys
MSE 351: Materials Thermodynamics
MSE 201: Materials Science I
MSE 101: Introduction to Materials Science (taught as an undergraduate)

PRESENTATIONS

- "Relative thermodynamic stabilities of Sc-containing surface configurations in scandate cathodes." M.N. Seif, T.J. Balk, and M.J. Beck, IEEE International Vacuum Electronics Conference, Monterey, CA, April 2022
- 22. "Combined effects of heterogeneity and length-scale on mechanical properties of lattice metamaterials." M.N. Seif and M.J. Beck, TMS Annual Meeting, Anaheim, CA, February 2022
- "Stochastic mechanical modeling of Duocel foam from micro- to macro- length scales." M.N. Seif, J. Puppo, M. Zlatinov, D. Schaffarzick, A. Martin, M.J. Beck, 2022 AIAA SciTech Forum, San Diego, CA, January 2022
- "Stochastic mechanical modeling of Duocel foam from micro- to macro- length scales." M.N. Seif, A. Martin, E. Stern, M.J. Beck, DCASS (virtual), March 2021
- "Stochastic modeling of elastic behavior of fibrous ablators." M.N. Seif, S. McDaniel, M.J. Beck, A. Martin, SciTech21 (virtual), January 2021
- 18. "Temperature effects on desorption behavior and characteristic Wulff shapes of scandate cathodes." M.N. Seif, T.J. Balk, M.J. Beck, IVEC, Monterey, CA (virtual), October 2020
- 17. "Temperature effects on desorption behavior and characteristic Wulff shapes of scandate cathodes." M.N. Seif, T.J. Balk, M.J. Beck, WE Local, Raleigh, NC, February 2020
- "Getting the most out of your first research experience" M.N. Seif, WE Local, Raleigh, NC, February 2020
- 15. "Ba transport in thermionic cathodes at operating temperature." M.N. Seif, Society of Women Engineers Annual Meeting, Anaheim, CA, November 2019
- 14. "The Hot Cathode Revolution." **M.N. Seif**, University of Kentucky Graduate School: Pre-3 Minute Thesis Competition, Lexington, KY, October 2019
- "Stochastic mechanical modeling of nanoporous materials accounting for connectivity and mixed loading states." M.N. Seif, S.W. Mays, K.M. Moody, T.J. Balk, A. Martin, M.J. Beck. Materials Science & Technology, Portland, OR, October 2019
- "Ba transport in scandate cathodes: evaporation, adsorption surface transport at operating temperature." M.N. Seif, T. J. Balk, M.J. Beck. Materials Science & Technology, Portland, OR, October 2019
- "Stochastic modeling of the effect of structural randomness on the mechanical behavior of 3D printed metallic powders." S.W. Mays, K.M. Moody, M.N. Seif, A. Martin, M.J. Beck. Materials Science & Technology, Portland, OR, October 2019

- 10. "The effect of fibrous geometry on thermomechanical behavior of phenolic impregnated carbon ablators for use in thermal protection systems." K.M. Moody, S.W. Mays, M.N. Seif, A. Martin, M.J. Beck. Materials Science & Technology, Portland, OR, October 2019
- "Using KICSS for Stochastic Multiscale Modeling of Random Structures." M.N. Seif, S.W. Mays, K.M. Moody, T.J. Balk, A. Martin, M.J. Beck. Integrated Computational Materials Engineering, Indianapolis, IN, July 2019
- 8. "Determining conditions and mechanisms for barium desorption from scandate cathode surfaces." Q. Zhou, M.N. Seif, X. Liu, T.J. Balk, M.J. Beck. TMS, San Antonio, March 2019
- "Modified Gibson-Ashby model accounting for network coordination derived from stochastic modeling of the mechanical behavior of nanoporous materials." M.N. Seif, M. Martin, S.W. Mays, T.J. Balk, M.J. Beck. TMS, San Antonio, March 2019
- "Getting the most out of your first research experience." M.N. Seif. WE Local, St. Louis, MO, March 2019
- 5. "Update on Current Research." M.N. Seif. ASM Bluegrass Chapter, Lexington, KY December 2018
- "Stochastic modeling of the effects of structural randomness on the mechanical behavior of discontinuous fiber-reinforced composites: revealing the role of network coordination state" M.N. Seif, M. Martin, D.J. Richardson, S. Mays, T.J. Balk, M.J. Beck. Materials Science & Technology, Columbus, OH, October 2018
- "Microstructural Evolution of LSCF Cathode During Coarsening via Surface Diffusion" C.-L. Park, H. Wang, M.N. Seif, S.A. Barnett, K. Thornton. Materials Research Society Spring Meeting, Phoenix, AZ, April 2018
- "Stochastic modeling of the effects of structural randomness on the mechanical behavior of nanoporous materials: revealing the role of network coordination state" M.N. Seif, M. Martin, D.J. Richardson, M. Turner, T.J. Balk, M.J. Beck. Graduate Collegiate Competition, WE Local, Tulsa, OK, January 2018
- "Insights into the Deformation of Nanoporous Gold using Scanning Nanobeam Diffraction" T.J. Balk, M.N. Seif, N.J. Briot, J. Ciston, T.C. Pekin, A.M. Minor. Materials Science & Technology, Pittsburgh, PA, October 2017.

SYNERGISTIC ACTIVITIES

Grand Tour Speaker, UK College of Engineering Sept. 2021 - Present I am the opening presenter for the UK College of Engineering's "Grand Tour", the College's principle on-campus recruiting activity.

Young Alumni Philanthropy Council, UK College of Engineering Feb. 2021 - Present As a member of this inaugural group, I am working to endow an undergraduate scholarship and direct funding to various College initiatives.

Special Topic: NextProf, NexusSeptember 2020This is a highly-competitive program for graduate students and post-doctoral scholars preparing to
pursue an academic career. It is organized by the University of Michigan, University of California
- Berkeley, and Georgia Tech.

Research Competition Committee, Society of Women Engineers Jan. 2020 - Present I serve on the organizing committee for the undergraduate and graduate research competitions held at SWE's annual Society meeting and WE Local conferences.

Founder/Director, GradSWE at the University of Kentucky Aug. 2019 - Present I founded a GradSWE group with the main objective of building a support system for engineering graduate students. I have recruited 25 members, secured over \$8000 in funding, and organized travel for 10 members to WE19, SWE's annual society conference.

Vice Chair, ASM Bluegrass

Apr. 2019 - Present My primary responsibilities included organizing recruitment efforts for new members, arrange speakers and events for chapter meetings, and acted as a liaison between ASM Bluegrass and UK's Material Advantage chapter. I also organized the October 2019 visit from ASM Trustee, Dr. Jason Sebastian, which was featured in ASM International's Winter 2019 newsletter.

Special Topic: ASM Leadership Training, ASM International August 2019

Grad. Programming Coordinator, Society of Women Engineers Oct. 2018 - Feb. 2020 Grad. Programming Coordinator-Elect, Society of Women Engineers Dec. 2017 - Oct. 2018

I was responsible for generating, gathering, approving, and implementing content (e.g. talks, sessions, programs) for graduate and perspective graduate students at SWE's annual society conferences. In this role, I was also a member of GradSWE's Leadership Team.

Vice Chair, Material Advantage Apr. 2016 - May 2017 I organized recruitment efforts aimed at first year engineering freshmen, which included designing promotional items and building the organization's first website. I also wrote MA's first formal budget and established an annual internal resume workshop.

Career Fair Chair, SWE at the University of Kentucky Apr. 2015 - May 2017 During my tenure, I improved employee registration to 100+ companies for the first time in the event's history. I coordinated 75+ student volunteers and acted as a liaison between students and College staff.

OUTREACH AND SERVICE IN THE COMMUNITY

Stonewall Elementary Science Fair, Judge	Dec. 2021
Engineering Open House, MSE Representative	Oct. 2021
WE21, Undergraduate Lighting Talk Competition Judge	Oct. 2021
WE21, Undergraduate Poster Competition Judge	Oct. 2021
WE21, Abstract Submission Reviewer	April 2021
One Day for UK, BBNfluencer	April 2021
Stonewall Elementary Science Fair, Judge	Dec. 2020
Alumni Mentors and Motivation, Engineering Alumni Speaker	Nov. 2020
Materials Engineering Recruiting Evening, Alumni Participant	Oct. 2020
College of Engineering Women in Engineering Evening, Alumni Speaker	Sept. 2020
SWE Research Competition Webinar, Invited Panelist	May 2020
Tates Creek High School Women in Engineering Panel, Invited Panelist	Feb. 2020
SWE's Lunch with an Engineer, Participant	Feb. 2020
College of Engineering Grand Tour, MSE Representative	JanFeb. 2020
Stonewall Elementary Science Fair, Judge	Dec. 2019
Engineering Open House, GradSWE Representative	Nov. 2019
Big10 Graduate School Expo, UK College of Engineering Representative	Oct. 2019
College of Engineering Grand Tour, MSE Representative	Aug. 2020
Women in Engineering Summer Camp, MSE Representative	June 2019
REU at the University of Kentucky , Graduate Student Representative	June 2019
Stonewall Elementary Science Night, MSE Representative	April 2019
Stonewall Elementary Science Fair, Judge	Dec. 2018