Johnson S. Alabi

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PROFESSIONAL SUMMARY

Mechanical and materials engineer and Ph.D. candidate with 5+ years of experience in computational modeling, experimental characterization, manufacturing process analysis, and AI/ML-assisted data workflows. Background includes steel heat treatment, phase transformation modeling, polymer composite structures, mechanical testing, microscopy, CAD, and data-driven process optimization. Proficient in Abaqus, ANSYS, COMSOL Multiphysics, FORGE, Thermo-Calc, JMatPro, MATLAB, Python, DOE, and engineering model validation.

EDUCATION

Ph.D. in Mechanical Engineering (GPA 4.00 / 4.00) Expected May 2027
Missouri University of Science and Technology, Rolla, MO, USA

Master of Science, Mechanical and Aerospace Engineering (GPA 4.00 / 4.00) December 2025
Missouri University of Science and Technology, Rolla, MO, USA

Bachelor of Engineering, Mechanical Engineering (CGPA 4.73 / 5.00) September 2021
Federal University Oye-Ekiti, Nigeria

EXPERIENCE

Graduate Research Assistant, Peaslee Steel Manufacturing Research Center **2023 - Present**

Missouri University of Science & Technology, Rolla, MO

- Built and validated coupled thermal-mechanical-metallurgical FEM model for quench-and-temper processing of low-alloy steels, including temperature-dependent properties, transformation-induced plasticity, and industrial heat-treatment boundary conditions. *Project supported by the Peaslee Steel Manufacturing Research Center with industrial implementation at Nucor Memphis.*
- Coupled Koistinen-Marburger martensite kinetics with Avrami-based diffusion transformation models in a multiphysics FEM workflow to predict phase evolution and final hardness trends.
- Developed an inverse heat-transfer calibration workflow for industrial quenching lines; instrumented dummy bars with thermocouples and dataloggers to extract production-relevant boundary conditions and improve FEA model accuracy.
- Designed and ran quench-and-temper and normalizing cycles for low-alloy steels; quantified microstructure using SEM, optical microscopy, and MIPAR image segmentation.
- Correlated hardness, tensile, and Charpy impact results with microstructure and simulation outputs to validate processing models and support heat-treatment decisions.

Graduate Researcher, Composite Materials Laboratory **2023 - Present**

Missouri University of Science & Technology, Rolla, MO

- Designed, modeled, and fabricated 3D-printed sandwich polymer composite coupons with modified honeycomb cores; compared compressive, flatwise, and edgewise performance with conventional designs using ASTM standards.
- Processed composite panels and coupons using VARTM, autoclave, microwave, and out-of-autoclave curing; linked cure quality, surface preparation, and face-sheet-to-core bonding with observed failure modes through microscopy and image analysis.
- Analyzed structural response and failure behavior to support lightweight composite design, manufacturing, and materials-performance evaluation.

- Prepared quarterly technical reports and presentations for industry partners.

Mechanical Engineering Intern, **April 2022**

Bohlar Integrated Service Limited, Lagos, Nigeria

- Developed CAD models and as-built drawings for industrial projects, including piping configurations based on client specifications.
- Conducted site inspections to verify installations with design drawings and engineering standards; supported engineering documentation for project delivery.
- Prepared AutoCAD piping-layout drafts in coordination with engineering and maintenance teams.

CORE ENGINEERING COMPETENCIES

- **Multiphysics & Constitutive Modeling:** Coupled thermal-mechanical-metallurgical FEA, inverse heat-transfer calibration, and phase transformation kinetics.
- **Experimental Materials Characterization:** Microstructure-property analysis using quantitative metallography and ASTM-standard mechanical testing.
- **Process Optimization & AI Workflows:** Python/MATLAB data analysis, machine-learning workflows, DOE, and model validation for heat-treatment and manufacturing studies.
- **Composite Design & Manufacturing:** Polymer and sandwich composite processing, structural testing, cure-method comparison, and failure analysis.

TECHNICAL SKILLS

- **Primary FEA & Thermodynamic Software:** FORGE NxT, Abaqus/CAE, Thermo-Calc (DICTRA/PRISMA).
- **Secondary Simulation Tools**: ANSYS, COMSOL Multiphysics, DIGIMU.
- **Programming & Automation:** Python, MATLAB, machine-learning workflows, Git/GitHub.
- **Testing & Metallography:** Instron testing (tensile, compression, flexural, flatwise/edgewise), Charpy impact, Jominy end-quench, SEM, optical microscopy, MIPAR phase segmentation.
- **Thermal & Composite Processing:** Quench-and-temper (Q&T), normalizing, induction/furnace heating, VARTM, autoclave, microwave, out-of-autoclave (OOA) curing.
- **CAD & Design:** SolidWorks, AutoCAD, Inventor, Fusion 360, CNC/G-code.

PUBLICATIONS

Journal Articles and Manuscripts

- Alabi, J. S., Heidari, E., Buchely, M. F., Chandrashekhara, K., Lekakh, S. N., O'Malley, R. J., Athavale, V. A., & Kumar, A. (2026). Multiphysics Simulation and Experimental Validation of Phase Transformation and Hardness in Jominy End-Quenched Low-Alloy Steels. Journal of Materials Engineering and Performance.
- **Alabi, J. S.**, Heidari, E., Buchely, M., Chandrashekhara, K., Lekakh, S., O'Malley, R. J., Athavale, V., & Pandey, A. (under review). A multiphysics approach for scaling the Jominy end-quench test to continuously quenched bars: Low-alloy steels.
- Heidari, E., **Alabi, J. S.**, Buchely, M., Chandrashekhara, K., Lekakh, S., O'Malley, R. J., Athavale, V., & Pandey, A. (under review). Effect of normalizing treatment on the microstructure and hardness of 4330V quenched and tempered, hot-rolled, continuously cast, large-diameter bar.

Conference Proceedings

- **Alabi, J. S.**, Heidari, E., Buchely, M., Chandrashekhara, K., Lekakh, S., O'Malley, R. J., Athavale, V., & Pandey, A. (2025). Influence of quenchant temperature on microstructure and hardness in Jominy end-quench tests for AISI 4135 steel. *Heat Treating Conference (QDE 2025). ASM.*

- **Alabi, J. S.**, Heidari, E., Buchely, M., Chandrashekhara, K., Lekakh, S., O'Malley, R. J., Athavale, V., & Pandey, A. Impact of quenching intensity conditions on microstructure and hardenability of low-alloy steel using a finite element model. *Heat Treating Conference (IFHTSE 2024). ASM*.

HONORS, AWARDS, AND FELLOWSHIPS

- Kaiser Fellowship, Department of Mechanical and Aerospace Engineering, Missouri University of Science and Technology (2023 – Present).
- International Student Impact Certificate (ISIC) and Letter of Recognition, Missouri University of Science and Technology (2026).
- Best Graduating Student, Department of Mechanical Engineering, Federal University Oye-Ekiti (2019 / 2020).
- Outstanding Leadership Award, Federal University Oye-Ekiti Student Union (2019 / 2020).

LEADERSHIP AND SERVICE

- Council Representative, ASME Missouri S&T Chapter (2024).
- Public Relations Officer, International Students Club, Missouri S&T (2024).
- Founder, Xcel360, a knowledge-sharing platform for graduate scholars and early-career researchers.
- President, Federal University Oye-Ekiti Students Union (February 2021 – August 2021).

PEER REVIEW, JUDGING & RECOGNITION

- Grand Award Judge, Materials Science Category, Regeneron ISEF (2026).
- Lead Judge, CASE Circle of Excellence Awards.
- Application Reader, Mandela Washington Fellowship, IREX / U.S. Department of State (2025).
- Peer Reviewer, International Journal of Materials Science and Applications.
- Research Feature: Poulain, N. (2025). *"Optimizing steel quenching with advanced FEM simulation."*

PROFESSIONAL AFFILIATIONS

- American Society of Mechanical Engineers (ASME).
- Material Advantage.
- Nigerian Society of Engineers (NSE).

CONFERENCE PRESENTATIONS

- Composites and Advanced Materials Expo (CAMX), Orlando, FL (September 8 - 11, 2025).
- 3rd International Conference on Quenching and Distortion Engineering (QDE 2025), Vancouver, Canada (May 5 - 8, 2025).
- IFHTSE World Congress and IMAT, Cleveland, OH (September 30 - October 3, 2024).
- AISTech Technology Conference, Association for Iron and Steel Technology, Columbus, OH (May 6 - 9, 2024).
- Composites and Advanced Materials Expo (CAMX), Atlanta, GA (October 30 - November 2, 2023).
- International Solid Freeform Fabrication Symposium (SFF), Austin, TX (August 11 - 14, 2023).

OUTREACH AND VOLUNTEER WORK

- Missouri State Fair Metallurgical Engineering Outreach, Missouri S&T (2023 - 2024).
- Academic Tutor, Federal University Oye-Ekiti: CAD instruction in AutoCAD, SolidWorks, and Inventor (January 2016 - 2020).