Oluwafemi A. Oyedeji

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EDUCATION

Ph.D. in Biosystems Engineering, University of Tennessee, Knoxville **2019**

MS in Chemical Engineering (Computational Science Minor) University of Tennessee, Knoxville **2018**

MS in Biosystems Engineering, Auburn University, Auburn **2015**

B.Eng. in Agricultural Engineering, Federal University of Technology, Akure **2011**

PROFESSIONAL EXPERIENCE

Oak Ridge National Laboratory, TN **01/2021 – To present**

R&D Associate Staff

- Expert in biomass supply chain management, preprocessing, and conversion, with focus on optimizing the entire biomass-to-biofuels and bioproducts value chain for efficiency, cost-effectiveness, and sustainability.
- Expert in multi-scale, multi-phase Computational Fluid Dynamics (CFD) simulations, driving innovation in chemical reactor modeling with high-fidelity prediction and process optimization.
- Developing advanced multi-physics models to analyze fluid flow, heat/mass transfer, and reaction kinetics in cutting-edge applications such as biomass conversion reactors and nuclear fuel coatings.
- Advancing AI-driven methods for high-performance multi-scale coupling and reduce-order modeling of reactive particulate flow modeling, improving simulation efficiency and predictive accuracy.
- Developing process models for biomass production and conversion systems to assess economic feasibility and environmental impacts to guide technology development and innovation.
- Using advanced Discrete Element Method (DEM) modeling to analyze and optimize cohesive particulate flow systems.
- Developing value-added, additively manufactured biocomposites utilizing fibers from agricultural waste and off-spec biofuel feedstock.

Oak Ridge National Laboratory, TN **03/2019 – 12/2020**

R&D Assistant Staff

- Calibrated algorithms using field data and applied mathematical and numerical models to gain insights into supply chain performance and critical design criteria.
- Conducted model verification and validation analyses, performing statistical analysis to quantify biomass variability and uncertainty.
- Developed models to predict changes in biomass quality during harvest, storage, and pre-processing, as well as estimate costs and resource requirements for innovative biomass technologies.
- Developed and validated CFD-DEM models for biomass pyrolysis and autothermal pyrolysis reactors, analyzing the effects of feedstock variability, reactor design, and operating parameters.
- Developed innovative biocomposite materials, integrating renewable biomass feedstocks for enhanced mechanical properties, sustainability, and cost-effectiveness in various applications.

University of Tennessee, Knoxville, TN **08/2015 – 01/2019**

Graduate Research Assistant

- Developed CFD–DEM models for biomass gasification and pyrolysis processes, integrating detailed kinetic reactions and stoichiometric equilibrium models to optimize performance and efficiency.

- Modeled high-temperature reactor feeding of cohesive, non-spherical particle flow for improved process control.
- Implemented machine learning analytics to gain insights into biomass preprocessing dynamics, driving innovation and process optimization for sustainable energy technologies.
- Evaluated and optimized catalysts for hydrogen production through shale gas steam reforming.

Oak Ridge National Laboratory, Oak Ridge, TN **05/2015 – 08/2015**

Advanced Short-Term Research Opportunity Fellow

- Developed a spatially resolved statistical framework to analyze corn stover moisture dynamics during field drying, enhancing biomass resource assessment across the United States.

Auburn University, Auburn, AL **08/2013 – 05/2015**

Graduate Research Assistant

- Developed experimental framework and statistical models to optimize biomass preprocessing, analyzing drying-grinding effects, moisture dynamics, energy use, and physical properties to enhance biofuel supply chain efficiency.

PROFESSIONAL AFFILIATIONS

- **Member (2019 – To present):** American Institute of Chemical Engineers.
- **Member (2014 – To present):** American Society of Agricultural and Biological Engineers.

REFEREED PUBLICATIONS

1. Starace, A. K., Palmer, S., Orton, K., Pierce, C., Christensen, E., Larson, A., ..., **Oyedeji, O. A.**, & Carpenter, D. **2025**. Influence of loblolly pine anatomical fractions and tree age on oil yield and composition during fast pyrolysis. Sustainable Energy & Fuels, 9(2), 501-512.
2. Saha, N., Klinger, J., Bhattacharjee, T., Xia, Y., Thompson, V., **Oyedeji, O. A.**, ... & Xu, Y. **2024**. The effect of air separations on fast pyrolysis products for forest residue feedstocks. Fuel, 375, 132572.
3. **Oyedeji, O. A.**, Hess, J., Zhao, X., Williams, L., Emerson, R., & Webb, E. **2024**. Exploring biofiber properties and their influence on biocomposite tensile properties. Polymer International.
4. Wiggins, G. M., **Oyedeji, O. A.**, & Mills, Z. G. **2024**. Modeling hydrodynamic and biomass pyrolysis effects of recycled product gases in a bubbling fluidized bed reactor. Biomass and Bioenergy, 184, 107172.
5. **Oyedeji, O. A.**, Zhao, X., Cochrane, J., Snider, H., Brown, H. R., Grejtak, T., ... & Webb, E. **2024**. Epoxy Coating of Biofiber: An Effective Modifier of Biofiber Physical and Flow Properties for Improved Tensile Behavior of Biofiber-Reinforced Biocomposite. Journal of the ASABE, 67(6), 1447-1458.
6. Chuahy, F. D. F., **Oyedeji, O.**, Lopez-Honorato, E., & Finney, C. **2024**. Numerical analysis of fluidized bed chemical vapor deposition of pyrolytic carbon for tristructural-isotropic (TRISO) fuel particles. Transactions of the American Nuclear Society, 130(1), 521-524.
7. **Oyedeji, O.A.**, Pecha, M.B., Finney, C.E.A., Peterson, C.A., Smith, R.G., Mills, Z.G., Gao, X., Shahnam, M., Rogers, W.A., Ciesielski, P.N., Brown, R.C., Parks II, J.E. **2022**. CFD–DEM modeling of autothermal pyrolysis of corn stover with a coupled particle- and reactor-scale framework. Chemical Engineering Journal. 446: 136920.
8. Houston, R., **Oyedeji O.A.**, Abdoulmoumine, N. **2022**. Detailed biomass fast pyrolysis kinetics integrated to computational fluid dynamic (CFD) and discrete element modeling framework: Predicting product yields at the bench-scale. Chemical Engineering Journal. 444: 136419.
9. Zhao, X., Copenhaver, K., Wang, L., Korey, M., Gardner, D.J., Li, K., Lamm, M.E., Kishore, V., Bhagia, S., Tajvidi, M. and Tekinalp, H., **Oyedeji, O.A.**, et al. **2022**. Recycling of natural fiber composites: Challenges and opportunities. Resources, Conservation and Recycling, 177: 105962.

10. Ciesielski, P.N., Pecha, M.B., Thornburg, N.E., Crowley, M.F., Gao, X., **Oyedeji, O.A.**, Sitaraman, H. and Brunhart-Lupo, N., **2021**. Bridging Scales in Bioenergy and Catalysis: A Review of Mesoscale Modeling Applications, Methods, and Future Directions. Energy & Fuels, 35(18): 14382–14400.
11. **Oyedeji, O.A.**, Langholtz, M., Hellwinckel, C., and Webb, E. **2021**. Supply analysis of preferential market incentive for energy crops. Biofuels, Bioproducts and Biorefining 15(3) 736–748.
12. **Oyedeji, O.A.**, Abdoulmoumine, N. H. **2020**. Equilibrium modeling and analysis of the formation of inorganic contaminants during biomass gasification. Transaction of ASABE 63(5): 1409–1425.
13. **Oyedeji, O.A.**, Abdoulmoumine, N. H. **2020**. Computational fluid dynamics and discrete element simulation of the formation of inorganic syngas contaminants during lignocellulosic biomass gasification. Sustainable Energy & Fuels (4): 4219–4231.
14. Yan, J., **Oyedeji, O.A.**, Leal, J.H., Donohoe, B., Semelsberger, T.A., Li, C., Hoover, A., Sun, N., Webb, E., Bose, E., Zeng, Y., Williams, L., Schaller, K., Ray, A.E., Tanjore, D. **2020**. Characterizing variability in lignocellulosic biomass – A review. Sustainable Chemistry & Engineering 8(22): 8059–8085.
15. **Oyedeji, O. A.**, Gitman, P., Qu, J., Webb, E. **2020**. Understanding the impact of lignocellulosic biomass variability on size reduction process – A review. Sustainable Chemistry & Engineering 8(6): 2327–2343.
16. **Oyedeji, O. A.**, Young, A., and Fasina, O. **2017**. Bending properties of loblolly pine. *Industrial Crops and Products* 109(1): 905–911.
17. **Oyedeji, O. A.**, Daw, C. S., Labbe, N., Ayers, P, D., and Abdoulmoumine, N. H. **2017**. Kinetics of the release of elemental precursors of syngas and syngas contaminants during switchgrass devolatilization. *Bioresource Technology* 244(1): 525–533.
18. **Oyedeji, O. A.**, Sokhansanj, S., and Webb, E. **2017**. Spatial analysis of stover moisture content during harvest season in the United States. *Transaction of ASABE* 60(4): 1015–1023.
19. **Oyedeji, O. A.**, and O. Fasina. **2017**. Impact of drying-grinding sequence on loblolly pine chips preprocessing effectiveness. *Industrial Crops and Products* 96(1): 8–15.
20. **Oyedeji, O. A.**, O. Fasina, S. Adhikari, T. McDonald, and S. Taylor. **2016**. The effect of storage time and moisture content on grindability of loblolly pine (Pinus taeda L.). *European Journal of Wood and Wood Products* 74(6): 857–866.
21. Ogunsina, B. S., Ojolo, S. J., Ohunakin, O. S., **Oyedeji, O. A.**, and Matanmi, K. A. **2014**. Pyrolytic conversion of spent palm fruit bunches into biofuels. *Journal of Raw Materials Research* 8(1&2): 50–60.

BOOKS, BOOK CHAPTERS, AND REPORTS

1. Langholtz M.H. et al. **2024**. 2023 Billion-Ton Report: An Assessment of US Renewable Carbon Resources. Oak Ridge National Laboratory (ORNL/SPR-2024/3103).
2. Adhikari, S., Abdoulmoumine, N., Nam, H., and **Oyedeji, O.A. 2017**. Chapter 16. Biomass gasification producer gas clean-up. In: Dalena, F., Basile, A., and Rossi, C. (Eds.), *Bioenergy Systems for the Future - Prospects for Biofuels and Biohydrogen*. (1st ed., pp. 541-558). Cambridge, United States: Elsevier Ltd.

NON-REFEREED PUBLICATIONS

1. Fasina, O., **Oyedeji, O.A.,** Olatunde, O., Adhikari, S., and McDonald, T. **2016**. Biomass size reduction: Necessary evil. Auburn Speaks – On Biofuels in the Southeast. 86-93.

PROFESSIONAL MEETING PRESENTATIONS

1. Conry, B., Honorato, E.L., Heldt, R., Chuahy, F.D.F., **Oyedeji, O.A.**, Gerczak, T. **2024**. Developments in Producing Pyrolytic Carbon Coatings for Advanced Particle Fuel Forms. Materials Science and Technology 2024. Pittsburgh, PA.
2. Saha, N., Klinger, J., Bhattacharjee, T., Xia, Y., Thompson, V., **Oyedeji, O.,** J.E., Parks, Shahnam, M., Xu, Y. **2024**. Air Classification of Forestry Residues for Fast Pyrolysis. 2024 AIChE Annual Meeting. San Diego, CA.

3. Zhao, X., **Oyedeji, O.**, Cochrane, J., Snider, H., Brown, H.R., Pu, Y., Williams, L., Ozcan S., Webb, E. **2024**. Epoxy-coating of off-spec biomass: A key modifier for improved mechanical strength of biocomposites. ASABE Annual International Meeting. Anaheim, CA.
4. Honorato, E.L., Dominguez-Ontiveros, E., Chuahy, F.D.F., Heldt, R., Gerczak, T., Finney, C., **Oyedeji, O.A.**, Conry, B., Montoya, K., Hunn, J. **2023**. Impact of Fluidization Behavior on the Development of Coated Particle Fuels. Materials in Nuclear Energy Systems (MiNES 2023). New Orleans, LA.
5. Langholtz, M. et al. **2023**. Overview of the 2023 Billion-Ton Report. Advanced Research Projects Agency-Energy (ARPA-E) Carbon Harvesting Workshop. Bethesda, MD.
6. Zhao, X., **Oyedeji, O.A.**, Williams, L., Ozcan, S., Webb., E. **2023**. Moisture management of biomass fibers to reduce carbon intensity of biocomposites. ASABE Annual International Meeting. Omaha, NE.
7. **Oyedeji, O.A.,** Kamath, D., Busch, I., Curran, S., Webb, E., Langholtz, M., Theiss, T. **2023**. Decarbonizing the U.S. Fossil Natural Gas Supply with Renewable Natural Gas: An Assessment of Economic Impacts and Emission Reduction Potentials ASABE Annual International Meeting. Omaha, NE.
8. **Oyedeji, O.A. 2022**. On CFD-DEM approach to modeling fluidized beds for bioenergy applications. ASABE Annual International Meeting. Houston, TX.
9. **Oyedeji, O.A.**, Webb, E.G., Finney, C.E.A., Parks, J.E. **2022**. Assessing the impacts of anatomical fraction and particle size variability on biomass pyrolysis with coarse-grained CFD–DEM simulation. ASABE Annual International Meeting. Houston, TX.
10. Kamath, D., **Oyedeji, O.A.**, Busch, I.K., Langholtz, M.H., Webb, E.G. **2022**. How best to allocate US biomass resources for least-cost decarbonization. ASABE Annual International Meeting. Houston, TX.
11. Zhao, X., **Oyedeji, O.A.**, Li, K., Tekinalp, H., Williams, L., Ozcan, S., Webb, E. **2022**. Developing biocomposites for large-scale additive manufacturing from low-value biomass fractions. ASABE Annual International Meeting. Houston, Texas TX
12. Pecha, M.B., Gao, X., **Oyedeji, O.A.**, Wiatrowski, M., Peterson, C., Brown, R., Finney, C.E. and Ciesielski, P.N., 2021, November. Modeling Biomass Pyrolysis at the Particle Scale: How Anisotropic Permeability Impacts Conversion Time and Reactor Sizing in Anoxic and Autothermal Conditions. In 2021 AIChE Annual Meeting. AIChE.
13. **Oyedeji, O. A. 2020**. On CFD-DEM modeling of fluidized beds for bioenergy applications. Presented at: 2020 Virtual AIChE Annual Meeting.
14. **Oyedeji, O. A.**, Pecha, B., Peterson, C., Whitmer, L., Finney, C., Parks, J., Adkins, B., Ciesielski, P., Brown, R. **2020**. Multiscale Modeling of Autothermal Pyrolysis of Corn Stover. Presented at: 2020 Thermal & Catalytic Sciences Virtual Symposium.
15. **Oyedeji, O. A.,** Webb, E. **2020**. DEM modeling of the contributions of biomass shape and size characteristic on bulk flow. Presented at: 2020 Virtual ASABE Annual International Meeting.
16. Wiggins, G., Adkins, B., Mills, Z., **Oyedeji, O.A.,** Finney, C., and Parks, J. **2019** Reduced-Order Modeling Techniques for Fluidized-Bed Biomass Pyrolysis. TC
17. Cruz, B., **Oyedeji, O.A.,** Ramirez, E., Daw, C., Abdoulmoumine, N**. 2018.** Determining and modeling the residence time distribution of biomass particles in a bench-scale bubbling fluidized bed reactor. ASABE Annual International Meeting. Detroit, Michigan.
18. **Oyedeji, O.A.,** Abdoulmoumine, N**. 2018.** Simulation of biomass gasification performance using non-stoichiometric equilibrium method. ASABE Annual International Meeting. Detroit, Michigan.
19. **Oyedeji, O.A.,** Abdoulmoumine. N**. 2018.** Simulation of nitrogen contaminants during biomass gasification using CFD-DEM approach. ASABE Annual International Meeting. Detroit, Michigan.
20. **Oyedeji, O. A.**, and Abdoulmoumine, N. **2017**. Kinetic investigation of the formation of biomass syngas precursors. Presented at: ASABE Annual International Meeting. Spokane, Washington.

21. Ownby, M., **Oyedeji, O. A.**, Liu, Q., and Abdoulmoumine, N. **2017**. Devolatilization kinetics of high ash containing switchgrass and park bark by differential thermogravimetry (DTG). Presented at: ASABE Annual International Meeting. Spokane, Washington.
22. Houston, R., **Oyedeji O. A.**, and Abdoulmoumine, N. **2017**. Development of a comprehensive computational fluid dynamics and discrete element model of biomass fast pyrolysis in a bubbling fluidized bed reactor Presented at: ASABE Annual International Meeting. Spokane, Washington.
23. **Oyedeji, O. A.**, and Abdoulmoumine, N. **2016**. Computational fluid dynamics (CFD) modeling of a bench-scale fluidized bed biomass gasifier using OpenFOAM. Presented at: ASABE Annual International Meeting. Orlando, Florida.
24. **Oyedeji, O. A.**, Sokhansanj, S., and Webb, E. **2016**. Spatial analysis of stover moisture content during harvest season in the United States. Presented at: ASABE Annual International Meeting. Orlando, FL.
25. **Oyedeji O. A.**, Fasina, O., Adhikari, S., and McDonald, T. **2015**. Effects of moisture content and storage time on specific grinding energy and physical properties of loblolly pine. Presented at: ASABE Annual International Meeting. New Orleans, Louisiana.
26. Young A., **Oyedeji**, **O. A.,** Fasina, O., Adhikari, S., and McDonald, T. **2015**. Influence of moisture content, tree height, and tree radius on toughness and strength of loblolly pine. Presented at: ASABE Annual International Meeting. New Orleans, Louisiana.
27. **Oyedeji, O. A.**, and Fasina, O. O. **2014**. A study on the moisture and storage effects on the specific grinding energy and some physical properties of loblolly pine. Presented at: Graduate Engineering Research Showcase. Auburn University, Alabama.
28. **Oyedeji, O. A.**, and Fasina, O. O. **2014**. Influence of moisture content and storage time on the grindability and some physical properties of loblolly pine. Presented at: The Annual Meeting of South-eastern Partnership for Integrated Biomass Supply Systems (IBSS). The University of Tennessee, USA.
29. Ogunsina, B. S., Ojolo, S. J., Ohunakin, O. S., **Oyedeji**, **O. A.,** Matanmi, K. A., and Bamgboye, I. A. **2012**. Potentials for generating alternative fuels from empty palm fruit bunches by pyrolysis. Presented at: The International Conference on Clean Technology and Engineering Management. Covenant University, Nigeria.
30. **Oyedeji, O. A.**, Agbetoye, L. A. S., and Adedeji, O. T. **2011**. Development of a Cassava Stem Planter. Presented at: The 11th International Conference and 32nd Annual General Meeting of the Nigerian Institution of Agricultural Engineers. University of Ilorin, Nigeria.

CERTIFICATIONS

Essential Computational Fluid Dynamics Course, CFD Direct	**2017**
Applied Computational Fluid Dynamics Course, CFD Direct	**2017**
OpenFOAM Foundation Course, OpenCFD Limited (ESI Group)	**2016**
OpenFOAM Advanced Course, OpenCFD Limited (ESI Group)	**2016**
Executive Certificate in Computer Studies, Federal University of Technology, Akure	**2009**

SKILLS AND PROFICIENCIES

- Computer Programming with C++, Python, R, and Fortran.
- Statistical Analysis and Predictive Modeling.
- Data Structures and Machine Learning Algorithms.
- Computational Fluid Dynamics (CFD) and Discrete Element Modeling (DEM).
- Linear Programming and Critical Path Analysis.
- Engineering Drawing.
- Statistical DOE.

- Chemical Process Design with Process Modeling, Technoeconomic Analysis, and Life Cycle Assessment.

EDITORIAL ACTIVITIES AND LEADERSHIP EXAMPLES

Manuscript review examples: ACS Sustainable Chemistry & Engineering, Separation Science and Technology, Industrial Crops and Products, Powder Technology, Transaction of the ASABE, ACS Energy & Fuels, Sustainability, Renewable Energy, Applied Engineering in Agriculture, BioResources, Biomass Conversion and Biorefinery. **Session Chair:** AIChE's Fluidization: Cohesive Materials and Other Interparticle Forces Session.