

Nathan L. Galinsky

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EDUCATION

Ph.D. Chemical Engineering	North Carolina State University Adviser: Dr. Fanxing Li	Dec. 2016
M.S. Chemical Engineering	North Carolina State University	Dec. 2013
B.S. Chemical Engineering	West Virginia University Institute of Technology	May 2011
Summa Cum Laude (3.97 GPA)		

TEACHING EXPERIENCE

West Virginia University Institute of Technology

Assistant Professor Department of Chemical Engineering

Aug. 16, 2019-Present

COURSES TAUGHT:

- CHE 211- Material Balances (F20)
- CHE 318- Particle Processing Operations (S20)
- CHE 320- Chemical Engineering Thermodynamics (F20)
- CHE 330-Modelling and Analysis (F19)
- CHE 350- Chemical Engineering Laboratory (S20)
- CHE 450- Unit Operations Lab I (F19, F20)
- CHE 451- Unit Operations Lab II (S20)

North Carolina State University, Raleigh, NC

Teaching Assistant for “Introduction to Chemical Engineering Analysis”, “Chemical Process Thermodynamics”, “Thermodynamics of Chemical and Phase Equilibria”, and “Design and Analysis of Chemical Reactors”
2012-2015

- Lectured in classrooms with student sizes between 60-100
- Prepared and delivered 50+ lectures
- Worked with students outside the classroom during formally held office hours.
- Worked with professors to discuss key parts of course syllabus suggesting changes to improve in areas such as grade distribution, course concepts, and homework and exam development
- Worked with professors to develop homework and test problems and solutions
- Created grading rubrics for homework and exams.
- Member of the Certificate of Academic Teaching (C.O.A.T) Program

Research/Professional Experience

Oak Ridge Institute for Science and Education, 3610 Collins Ferry Road Morgantown, WV 26505
Sept. 22, 2016- June 14, 2019

Postdoctoral Fellow, Mentors: Samuel Bayham/Ronald Breault-Thermal Sciences Team

- Developed engineering models based on fundamental material properties to help predict mechanical particle attrition in various units of a circulating fluidized bed reactors.
- Combined fundamental engineering models, material properties, system operation

parameters, and excel to develop a zero-order spreadsheet model to predict attrition in a circulating fluidized bed reactor.

- Working with engineers, environmental health and safety, and others in NETL's design process of a particle impact unit for measuring impact attrition and a fluidized bed reactor for studying redox reactions with oxygen carriers and effect of pollutants (sulfur and chlorine) on reactions.
- Developed and implemented experimental test plans to accomplish and meet milestones for particle attrition work.
- Worked with operators to perform experimental test plans and obtain relevant experimental data.
- Designed and modified pre-existing fluidized bed, jet cup, and cold flow equipment to perform additional attrition tasks, increase range of capabilities, and for ease of operability.

North Carolina State University, 911 Partners Way Raleigh, NC 27606

Aug. 11, 2011- Aug. 31, 2016

Adviser: Fanxing Li

Thesis Topic: "Rational Design of Redox Metal Oxides for Carbonaceous Fuel Conversion and CO₂ Capture"

- Developed oxygen carriers with nearly 70 times higher activity for methane conversion than traditional metal oxides leading to some of the most active oxygen carriers tested to date.
- Designed and implemented set-up of reactor panels including the automation of valve control and measurement of temperature and pressure data using Labview that is now used on most of the reactor systems.
- Investigated the properties of ceramic supports with iron oxide for chemical looping conversion, leading to design principles for iron based redox metal oxides.
- Investigation of metal oxides for enhanced conversion of solid coal char. Investigated effects of various dopants on base metal oxide performance.
- Testing other applications of oxygen carriers with low oxygen release for use in catalytic systems such as three-way catalysts.
- Study of surface and bulk properties (i.e. oxygen surface exchange and ionic conductivity) to further understand mechanisms and rate limiting steps of oxygen carriers for chemical looping schemes.

RESEARCH INTERESTS:

- Catalyst development for fossil energy conversion and commodity chemical production
- Fluidized bed design
- Carbon capture
- Chemical looping
- Educational research-focus on technology use in the classroom

SKILLS

- **Material Design:** Synthesis of metal oxides using: solid state reaction, sol-gel, precipitation, and impregnation techniques.
- **Analytical Techniques:** Thermogravimetric analysis, Differential thermal gravimetry analysis, BET (N₂ and Kr Physisorption), X-ray Diffraction (both In-situ and ex-situ), Mass Spectrometry, Scanning Electron Microscopy, Energy Dispersive X-ray Spectroscopy, Temperature Programmed Desorption/Reduction/Oxidation, QICPIC particle size distribution
- **Reactor Operation/Design:** Operation of fluidized and fixed bed reactors; designed and implemented Labview code for automated operation of reactors (with Temperature and Pressure monitoring); design of particle attrition impactor and fluidized bed reactor

- **Software:** Labview, Microsoft Office, Origin, Highscore Plus, MATLAB, MATHCAD, QICPIC, Basic ASPEN knowledge, Basic Adobe Inventor knowledge

PUBLICATIONS

- Galinsky, N. et al. "Iron Oxide with Facilitated O² Transport for Facile Fuel Oxidation and CO₂ Capture in a Chemical Looping Scheme." ACS Sustain. Chem. Eng. 2013, 1, 364-373
- He, F., Galinsky, N., Li, F. "Chemical Looping Gasification of Solid Fuels Using Bimetallic Oxygen Carrier Particles- Feasibility Assessment and Process Simulations." Int. J. Hydrog. Energy, 2013, DOI: 10.1016/j.ijhydene.2013.04.054
- Shafiefarhood, A., Galinsky, N., Huang, Y., Chen, Y., Li, F. "Fe₂O₃@La_{1-x}Sr_xFeO₃ Core-Shell Redox Catalyst for Chemical Looping Reforming of Methane." ChemCatChem, 2014, DOI: 10.1002/cctc.201301104
- Chen, Y., Galinsky, N., Wang, Z., Li, F. "Investigation of Perovskite Supported Composite Oxides for Chemical Looping Conversion of Syngas." Fuel, 2014, DOI: 10.1016/j.fuel.2014.06.017
- Galinsky, N. et al. "Effect of Support on Redox Stability of Iron Oxide Based Oxygen Carriers for Chemical Looping Conversion of Methane." Applied Catalysis B: Environmental. 2015, DOI: 10.1016/j.apcatb.2014.09.023
- Galinsky, N. et al. "Ca_{1-x}A_xMnO₃ (A= Sr and Ba) perovskite-based oxygen carriers for chemical looping with oxygen uncoupling (CLOU)." Applied Energy. 2015, DOI: 10.1016/j.apenergy.2015.04.020
- Mishra, A., Galinsky, N., He, F., Santiso, E., Li, F. "Perovskite-Structured AM_nB_{1-x}O₃ (A= Ca or Ba; B= Fe or Ni) Redox Catalysts for Partial Oxidation of Methane." Catal. Sci. Tech., 2016
- Galinsky, N. et al. "CaMn_{1-x}B_xO_{3.δ} (B= Al, V, Fe, Co, and Ni) Perovskite Based Oxygen Carriers for Chemical Looping with Oxygen Uncoupling (CLOU)." Applied Energy. 2016, DOI: 10.
- Monazam E., Galinsky, N., Breault, R., and Bayham, S. "Attrition of hematite particles for chemical looping combustion in a conical jet cup." Powder Technology. 2018, DOI: <https://doi.org/10.1016/j.powtec.2018.09.027>
- Galinsky, N. et al. "Oxygen Carrier Structure and Attrition." *Handbook of Chemical Looping Technology*. Wiley. pp 263-301. 2018
- Li, F., Galinsky, N., Shafiefarhood, A. "Mixed Metal Oxide-Based Oxygen Carriers for Chemical Looping Applications." *Handbook of Chemical Looping Technology*. Wiley. pp 229-261. 2018.
- Bayham, S., Galinsky, N., Hughes, B., Wei, X. "Analysis of hematite in a grid jet apparatus" Powder Technology. 2020, DOI: <https://doi.org/10.1016/j.powtec.2020.11.002>

SELECT PRESENTATIONS

- Nathan Galinsky, Yan Huang, Arya Shafiefarhood, and Fanxing Li. "Carbonaceous Fuel Conversions Through Redox Reactions of Oxygen Carrying Materials- Effect of Support." 2012 AIChE Meeting, Pittsburgh, PA. 2012.
- Nathan Galinsky, Yan Huang, Arya Shafiefarhood, Fanxing Li. "Mixed-conductor supported iron oxide for carbonaceous fuel oxidation and CO₂ capture." 245th ACS National Meeting. New Orleans, Louisiana. 2013.
- Nathan Galinsky, Arya Shafiefarhood, Yanguang Chen, Fanxing Li. "Activation and Deactivation Mechanism of Supported Iron Oxides for Carbonaceous Fuel Conversion and CO₂ Separation." 2013 AIChE National Meeting. San Francisco, CA. 2013.
- Nathan Galinsky and Fanxing Li. "Supported oxides for methane conversion with integrated CO₂ capture: Activation and deactivation studies." 247th ACS National Meeting. Dallas, Texas. 2014.

- Nathan Galinsky, Arya Shafiefarhood, Fanxing Li. "Partial oxidation of Methane using Mixed-Conductor Enhanced Redox Catalysts." The Clearwater Clean Coal Conference. Clearwater, Florida. 2014.
- Nathan Galinsky, Amit Mishra, and Fanxing Li. "Perovskite based oxides for chemical looping with oxygen uncoupling (CLOU)." 2014 AIChE National Meeting. Atlanta, GA. 2014.
- Nathan Galinsky, Samuel Bayham, Ronald Breault. "Attrition Prediction and Reactive Jet Cup Testing of Oxygen Carriers for Chemical Looping Combustion." 2017 AIChE National Meeting. Minneapolis, MN. 2017.

SELECT AWARDS/RECOGNITION

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| • Hazleton/Mellow Fellowship (WVUIT) | 2008-2011 |
| • AIChE Outstanding Senior in Chemical Engineering (WVUIT) | 2011 |
| • Presidential Leadership Citation of College of Engineering at WVUIT (top student) | 2011 |
| • College of Engineering Merit Award (NCSU) | 2014 |
| • Cover article for ACS Sustain. Chem. Eng. and media coverage in AIChE's Chemical Engineering Progress magazine | 2014 |
| • Vivian T. Stannett Early Publication Fellow Runner-up (NCSU) | 2014 |
| • NCSU GAANN Nanoscale Electronic and Energy Materials (NEEM) Fellowship | 2014-15 |
| • Teaching Assistant Award in Mentorship (NCSU) | 2014; 2015 |
| • 3 rd Place poster winner at NCSU Graduate Student Symposium | 2015 |
| • Praxair Teaching Fellow (NCSU/Praxair) | 2016 |
| • James K. Ferrell Outstanding PhD Award (NCSU) | 2017 |

Educational Outreach/Volunteer

- Undergraduate research mentorship: worked directly with 4 undergraduate students providing assistance and guidance for individual research projects (including 3 co-authored papers); also trained ~20 additional students (undergraduate and graduate) on specific equipment and analytical techniques.
- Helped mentor three high school students for completion of a research project that involved a proposal for research task for Siemens Science Competition. The students finished as semi-finalists in the national competition.
- Educational Outreach by mentoring Mickey Leland Energy Fellow at Department of Energy for Summer of 2018.
- Volunteered at the Regional West Virginia Science Bowl for middle and high school students held at WVU in 2018-2019.
- Regional Math Field Day Volunteer (Feb 29th 2020)
- WVU Tech MLK Day volunteer (Helped the city of Beckley, WV renovate one of the city houses)
- Volunteered for Upward Bound STEM day involving students with a chemical engineering experiment (Jan 2020).

Certificates

- American Council on Education Certificate in Effective College Instruction (Dec. 21, 2020)