

# 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 330-Modelling and Analysis (Fall '19)
- CHE 450- Unit Operations Lab I (Fall '19)

### **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 CO<sub>2</sub> 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 (N<sub>2</sub> 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 O<sup>2</sup> Transport for Facile Fuel Oxidation and CO<sub>2</sub> 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
- Shafieifarhood, A., Galinsky, N., Huang, Y., Chen, Y., Li, F. "Fe<sub>2</sub>O<sub>3</sub>@La<sub>1-x</sub>Sr<sub>x</sub>FeO<sub>3</sub> 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<sub>1-x</sub>A<sub>x</sub>MnO<sub>3</sub> (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<sub>n</sub>B<sub>1-x</sub>O<sub>3</sub> (A= Ca or Ba; B= Fe or Ni) Redox Catalysts for Partial Oxidation of Methane." Catal. Sci. Tech., 2016
- Galinsky, N. et al. "CaMn<sub>1-x</sub>B<sub>x</sub>O<sub>3-δ</sub> (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., Shafieifarhood, A. "Mixed Metal Oxide-Based Oxygen Carriers for Chemical Looping Applications." *Handbook of Chemical Looping Technology*. Wiley. pp 229-261. 2018.

## **SELECT PRESENTATIONS**

- Nathan Galinsky, Yan Huang, Arya Shafieifarhood, 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 Shafieifarhood, Fanxing Li. "Mixed-conductor supported iron oxide for carbonaceous fuel oxidation and CO<sub>2</sub> capture." 245<sup>th</sup> ACS National Meeting. New Orleans, Louisiana. 2013.
- Nathan Galinsky, Arya Shafieifarhood, Yanguang Chen, Fanxing Li. "Activation and Deactivation Mechanism of Supported Iron Oxides for Carbonaceous Fuel Conversion and CO<sub>2</sub> Separation." 2013 AIChE National Meeting. San Francisco, CA. 2013.
- Nathan Galinsky and Fanxing Li. "Supported oxides for methane conversion with integrated CO<sub>2</sub> capture: Activation and deactivation studies." 247<sup>th</sup> ACS National Meeting. Dallas, Texas. 2014.
- Nathan Galinsky, Arya Shafieifarhood, 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**

- 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<sup>rd</sup> 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.