Conrad R. A. Cole

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EDUCATION

University of Florida, Gainesville, FL **2014 - 2021**
Ph.D., Mechanical Engineering
Dissertation Title: Electronic Entropy Contributions to Oxygen Vacancy Formation Reaction in Nonstoichiometric Oxides

University of Florida, Gainesville, FL **2012 - 2014**
M.S., Mechanical Engineering

University of Central Florida, Orlando, FL **2005 - 2010**
B.S., Mechanical Engineering

SUMMARY

Diverse array of research experience in renewable energy science and technology. Primarily interested in the direct conversion and storage of solar energy through clean, renewable processes. Computational and experimental experience in the discovery and analysis of novel materials for solar and electrochemical energy storage applications. Currently open to positions in computational science, scientific computing, materials science, chemical engineering, renewable energy research and development, utilities (generation, supply and delivery), STEM education/mentoring.

SKILLS

Technical Communication, Organizational Leadership, Adaptability, Multidisciplinary Thinking, Python, C/C++, High-Performance Computing, Scientific Computing, DFT, VASP, Pymatgen, Linux/Ubuntu, Unix Shell, Git, PyCharm, Visual Studio, Wolfram Mathematica

EXPERIENCE

Graduate Research Assistant, University of Florida, Gainesville, FL **August 2014 – August 2020**

- Helped build new laboratory, setup multiple workstations and create respective standard operating protocol
- Developed mathematica scripts that convert raw thermogravimetric data to oxygen nonstoichiometry as a function of temperature and oxygen partial pressure
- Developed mathematica scripts that fit defect reaction models to nonstoichiometry data and extracts partial molar thermodynamic quantities
- Synthesized and characterized perovskite oxides for solar thermochemical fuel synthesis
- Leveraged electronic structure theory (VASP, Pymatgen, CASM), condensed matter physics, statistical mechanics and chemical physics in order to complement experimental work
- Applied computational tools to quantitatively validate novel theory which was derived analytically (abstracts accepted by The Materials Research Society, The American Chemical Society and The American Institute of Chemical Engineers)

Graduate Teaching Assistant, University of Florida, Gainesville, FL **Jan 2015 - May 2017**

- Proctored exams, held instructional office hours, and facilitated learning for over 100 students per semester for Thermodynamics (EML 3100) and Fluid Mechanics (EGN 3353)
- Designed and graded exam problems, organized special preparatory sessions prior to exams
- Communicated with students through course website in order to address specific learning needs and share useful supplemental material

Mickey Leland Energy Fellow, NETL, Morgantown, WV **June 2014 - Aug 2014**

- Research Fellowship on the Hybrid Performance Project (HYPER) at the National Energy Technology Laboratory
- Utilized dSPACE and MATLAB & Simulink to perform cyber-physical simulations of a solid oxide fuel cell gas turbine hybrid system
- Analyzed fuel cell electrical load transients and their consequent effects on the operating conditions of solid oxide fuel cell gas turbine hybrid system

Consultant, Booz Allen Hamilton, Orlando, FL **October 2010 - Jun 2011**

- Developed 3D model of urban environment in Google Sketchup software with layers and dimensions in order to specify characteristics of each structure which facilitated meetings with client for generation of system requirements
- Created and maintained corresponding spreadsheet for configuration of live structures and other physical features with detailed dimensions and specifications
- SharePoint site administrator, responsible for multiple tasks including creating working group sites to enhance collaboration between team members and monitoring user site permissions

PUBLICATIONS

Cole, C. R., & Scheffe, J.R. (2016). Thermodynamic Characterization of Yttrium Strontium Manganite Perovskites and Influence of Temperature on Redox Properties. Presentation at the ASME 10th International Conference on Energy Sustainability, Charlotte, NC.

Cole, C. R. (2019). Estimation of Electronic Entropy Contributions to Oxygen Vacancy Formation Reaction in Nonstoichiometric Oxides via analysis of electronic structure properties. Presentation at the Materials Research Society Fall Meeting & Exhibit, Boston, MA.

Randhir, K., Rhodes, N. R., Grunewald, J., **Cole, C. R.**, Bobek, M., Li, L., Hahn, D. W., Mei, R., Klausner, J. F., AuYeung, N. (2014). Thermochemical Energy Storage Using Strontium Carbonate/Strontium Oxide System for Solar Energy Utilization. Presentation at the 2014 AIChE Annual Meeting, Atlanta, GA.

HONORS & AWARDS

Graduate School Fellowship, University of Florida, 2014
Mickey Leland Energy Fellowship, Department of Energy, 2014
Travel Grant, University of Florida Graduate Student Council, 2013
Graduate Student Scholarship, National Society of Black Engineers, 2013
Dean's List, University of Central Florida, 2010
UCF Scholar's Award, University of Central Florida, 2010

COURSEWORK

Foundations of Machine Learning**,** Financial Engineering and Risk Management, Computational Chemistry, Data Structures and Algorithms, Electroceramics, Numerical Methods of Engineering Analysis, Principles of Engineering Analysis, Mathematical Basis of Chemical Engineering, Python Programming, Solid State Chemistry, Solar Energy Utilization

VOLUNTEERING

- Founded the American Association of Blacks in Energy (AABE) Gator Chapter at the University of Florida during Master's degree program. AABE is dedicated to ensure the input of African Americans and other minorities into the discussions and developments of energy policies regulations, R&D technologies, and environmental issues.
- Active member of the National Society of Black Engineers, the National Society of Black Physicists, American Society of Mechanical Engineers, American Institute of Chemical Engineers, Materials Research Society, American Chemical Society and American Physical Society.

PROJECTS

- Contributed to python for materials genomics (pymatgen) code repository; added additional functionality to run type detection for density functional theory calculations
- Quantified factors influencing Auto Loan Delinquency via tree-based Feature Importance (Decision Tree, AdaBoost, Random Forest and Permutation) and time-series analysis of GM Financial Consumer Automobile Receivables Trust Data
- Performed Classification of brick patterns (11383 images in training set) via Convolutional Neural Network (pytorch) and Probabilistic Generative Classifier using edges and colors as features and a Support Vector Machine using Histogram of Oriented Gradients as a feature vector
- Leveraged PCA to predict monthly change in future value of a portfolio composed of Swiss Government Bonds via multivariate time series analysis of historical monthly yield data

- Utilized bootstrapping, pseudoinverse method and Lorimier's Theorem to estimate term structure (ZCB Prices, Simple Forward Rates and Yield Curve) over 30 year period with limited market quote data from multiple asset classes
- Implemented simplified version of google's page rank graph algorithm via adjacency list
- Implemented linking and build configuration for OpenGL app (visualization of sorting algorithms) in linux (ubuntu) via cmake
- Performed ab initio statistical mechanical investigation via cluster expansion and Monte Carlo simulations implementing various techniques in supervised learning (Genetic Algorithm and recursive feature elimination for feature selection, k-fold CV, ridge regression for estimation)

SELECT REFERENCES

David W. Hahn
Craig M. Berge Dean – College of Engineering
University of Arizona
Tucson, AZ 85721
dwhahn@arizona.edu
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Chair of doctoral supervisory committee.

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Co-chair of doctoral supervisory committee.

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Mentor during doctoral studies.

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