

# Joseph Graham, Ph.D.

Assistant Professor of Nuclear Engineering and Materials Science  
Director of the Nuclear Reactor  
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Missouri University of Science and Technology

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## Education

- **The University of Texas at Austin** Austin, TX  
*Ph.D. Nuclear Engineering* 2011 - 2013
  - Dissertation: A Study of the Ferroelectric Properties of Neutron Irradiated Lead Zirconate Titanate
  - Advisors: Sheldon Landsberger, Ph.D. and Paulo Ferreira, Ph.D.
- **The University of Texas at Austin** Austin, TX  
*M.S.E. Nuclear Engineering* 2009 - 2011
  - Master's Thesis: Characterization of Neutron Flux Spectra for Radiation Effects Studies
  - Advisors: Sheldon Landsberger, Ph.D. and Paulo Ferreira, Ph.D.
- **McGill University** Montreal, QC  
*B.S. Physics* 2006 - 2009
  - Senior Thesis: Characterization of Pyrrhotite Using Mössbauer Spectrometry

## Work Experience

- **Missouri University of Science and Technology** Rolla, MO  
*Assistant Professor* August 2015 - Present
  - Experimental and computational research in areas related to materials in extreme environments, nuclear ceramics, radiation effects, particle interactions in solids, characterization of materials
- **The University of Tennessee, Knoxville** Knoxville, TN  
*Postdoctoral Research Associate* August 2013 - August 2015
  - Studying radiation effects in ceramics with nuclear applications through ion beam irradiations, characterizing radiation effects with ion beam analysis techniques (RBS/C, ERDA, ionoluminescence), and developing post-irradiation characterization methods using Raman spectroscopy.
- **The University of Texas, Austin** Austin, TX  
*Graduate Research Assistant* August 2009 - August 2013

- Worked at a 1 MW research nuclear reactor at the Nuclear Engineering Teaching Laboratory (NETL) conducting neutron irradiations to study neutron irradiation effects in electronic materials, performed neutron activation analysis for reactor neutron dosimetry measurements, and prepared radioisotopes for radiochemical analyses.

- **Sandia National Laboratories** Albuquerque, NM  
*Graduate Student Research Intern* *May 2010 - August 2012*
  - Performed a portion of the experimental work for Ph.D. dissertation pertaining to the characterization of neutron radiation effects in lead zirconate titanate. This included sample synthesis and post-irradiation characterization.
- **Sandia National Laboratories** Albuquerque, NM  
*Undergraduate Student Research Intern* *June 2008 - August 2008*
  - Developed a numerical model of a novel MEMS-based high sensitivity neutron detector.
- **The Jet Propulsion Laboratory** Pasadena, CA  
*Summer Undergraduate Intern* *May 2007 - August 2007*
  - Performed numerical analysis of atmospheric radiative transfer data from the Cassini-VIMS spacecraft.

## Grants

- **Department of Energy NEUP**  
*Principal Investigator* *October 1, 2017 - September 30, 2020*
  - Title: "Gamma-ray Computed and Emission Tomography for Pool-Side Fuel Characterization"
  - Total award amount: \$800,000. PI share: \$373,700
- **National Science Foundation Div. of Materials Research**  
*Co-Principal Investigator* *August 1, 2017 - July 31, 2021*
  - Title: "Intrinsic Properties of Zirconium Carbide Ceramics"
  - Total award amount: \$640,000. co-PI share: \$211,000
- **Campus Materials Research Center Seed Grant**  
*Principal Investigator* *October 26, 2016 - June 30, 2017*
  - Title: "Photothermal Radiometer for Thermal Diffusivity Measurements"
  - Total award amount: \$16,473

## Awards, Fellowships & Honors

Nuclear Regulatory Commission Graduate Fellowship Grant . . . . .	2012-2013
Nuclear Fuel Cycle Innovation Award . . . . .	2012
Leigh Family Endowed Graduate Fellowship, U. of Texas Austin . . . . .	2012-2013
Leigh Family Endowed Graduate Fellowship, U. of Texas Austin . . . . .	2011-2012
Engineering Foundation Endowed Presidential Graduate Fellowship, U. of Texas Austin	2010-2011
National Institute of Nano Engineering Fellowship . . . . .	2009-2012

## Publications and Talks

- Refereed National Journals: h-index 6, 102 citations
  - Joseph Graham, Yanwen Zhang, and William Weber, "Irradiation-induced defect formation and damage accumulation in single crystal CeO<sub>2</sub>," *Journal of Nuclear Materials*, Vol. 498, p. 400 (2018)
  - Miguel Crespillo, Joseph Graham, Fernando Agullo-Lopez, Yanwen Zhang, and William Weber, "Correlation between Cr<sup>3+</sup> Luminescence and Oxygen Vacancy Disorder in Strontium Titanate under MeV Ion Irradiation," *Journal of Physical Chemistry C*, Vol. 121, p. 19758 (2017)
  - Miguel Crespillo, Joseph Graham, Fernando Agullo-Lopez, Yanwen Zhang, and William Weber, "Role of oxygen vacancies on light emission mechanisms in SrTiO<sub>3</sub> induced by high-energy particles," *Journal of Physics D: Applied Physics*, Vol. 50, p. 155303 (2017)
  - Chien-Hung Chen, Yanwen Zhang, Yongqiang Wang, Miguel Crespillo, Cristiano Fontana, Joseph Graham, Gerd Duscher, Steven Shannon and William Weber, "Dose dependence of helium bubble formation in nano-engineered SiC at 700 deg C," *Journal of Nuclear Materials*, Vol. 472, p. 153 (2016)
  - Miguel Crespillo, Joseph Graham, Yanwen Zhang and William Weber, "Temperature measurements during high flux ion beam irradiations," *Review of Scientific Instruments*, Vol. 87, p. 024902 (2016)
  - Miguel Crespillo, Joseph Graham, Yanwen Zhang and William Weber, "In-situ luminescence monitoring of ion-induced damage evolution in SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>," *Journal of Luminescence*, Vol. 172, p. 208 (2016)
  - Cristiano Fontana, Chien-Hung Chen, Miguel Crespillo, Joseph Graham, Haizhou Xue, Yanwen Zhang and William Weber, "Stopping Power Measurements with the Time-of-Flight (ToF) Technique," *Nuclear Instruments and Methods in Physics Research B*, Vol. 366, p. 104 (2016)
  - Alexandra Henriques, Joseph Graham, Sheldon Landsberger, Jon Ihlefeld, Geoff Brenneka, Donald Brown, Jennifer Forrester and Jacob Jones "Crystallographic changes in lead zirconate titanate due to neutron irradiation," *AIP Advances*, Vol. 4, p. 117125 (2014)
  - Yanwen Zhang, Miguel Crespillo, Haizhou Xue, Ke Jin, Chien-Hung Chen, Cristiano Fontana, Joseph Graham and William Weber "New ion beam materials laboratory for

materials modification and irradiation effects research,” Nuclear Instruments and Methods in Physics Research B, Vol. 338, p. 19 (2014)

- Joseph Graham, Geoff Brenneka, Paulo Ferreira, Leo Small, David Duquette, Christopher Applett, Sheldon Landsberger and John Ihlefeld ”Neutron irradiation effects on domain wall mobility and reversibility in lead zirconate titanate thin films,” Journal of Applied Physics, Vol. 113, Issue 12, p. 124104 (2013)
- Joseph Graham, Steven Biegalski, and Bruce Bucholtz ”Preparation of radio-Sm by neutron activation for accelerator mass spectrometry,” Journal of Radioanalytical and Nuclear Chemistry Vol. 296, Issue 1, p. 233 (2013)
- Joseph Graham, Sheldon Landsberger, Paulo Ferreira, John Ihlefeld and Geoff Brenneka ”Neutron Flux Characterization Techniques for Radiation Effects Studies,” Journal of Radioanalytical and Nuclear Chemistry, Vol. 291, p. 503 (2012)
- Alexander Navarra, Joseph Graham, Stephanie Somot, Dominic Ryan and John Finch ”Mössbauer Quantification of Pyrrhotite in Relation to Self-heating,” Minerals Engineering, Vol. 23, Issue 8, p.652-658 (2010)

- Conference Proceedings

- Joseph Graham, Sheldon Landsberger, Donald Millsap, Paulo Ferreira, Carl Frahme and Ron Dougherty ”Curriculum Development for a Modular Short Course on Radiation Effects in Electronics,” Nuclear Education and Training (NESTet) Transactions (2013)
- Sheldon Landsberger, Joseph Graham and Cameron Knapp ”Curriculum Development for an Introductory Short Course in Nuclear Science and Engineering,” Nuclear Education and Training (NESTet) Transactions (2013)
- Joseph Graham, Kenneth Dayman, Urairisa Phathanapirom, Kristen McConnell, Brian Epping and Erich Schneider ”A Comparative Study of CANDLE Reactor Based U.S. Nuclear Fuel Cycles,” American Nuclear Society Transactions (2012)
- Joseph Graham, Sheldon Landsberger and Geoff Brenneka ”Ferroelectric Changes in Neutron Irradiated Lead Zirconate Titanate,” American Nuclear Society Transactions, Vol. 104, Number 1, p. 241 (2011)

- Talks

- ”Correlation between Cr<sup>3+</sup> Luminescence and Oxygen Vacancy Disorder in SrTiO<sub>3</sub> under MeV Ion Irradiation,” Materials Science and Technology, Pittsburgh, PA, October 2017
- ”Structural, Chemical and Thermal Property Changes of Zirconium Diboride under Ion Beam Irradiation,” Materials Science and Technology, Pittsburgh, PA, October 2017
- (invited) ”Modification of the Thermal Properties of Zirconium Diboride by Heavy Ion Irradiation,” 24th International Conference on Accelerator Applications in Research and Industry (CAARI), Ft. Worth, TX, October 2016
- ”Characterization of Irradiation Damage in Single Crystal Ceria by Ion Channeling and Confocal Raman Spectroscopy,” European Materials Research Society (EMRS) meeting, May 2015, Lille, France

- "Examining the effects of charge defects on domain switching in thin film PZT via controlled neutron irradiation," Electronic Materials and Applications, January 2013, Orlando, FL
- "A Comparative Study of CANDU Reactor Based U.S. Nuclear Fuel Cycles," American Nuclear Society Annual Meeting, June 2012, Chicago, IL
- "Preparation of Radio-Sm by Neutron Activation for Accelerator Mass Spectrometry," Methods and Application of Radioanalytical Chemistry IX, 2012, Kona, HI
- "Ferroelectric Changes in Neutron Irradiated Lead Zirconate Titanate," American Nuclear Society Annual Meeting, 2011, Hollywood, FL
- "Neutron Flux Characterization Techniques for Radiation Effects Studies," 13th International Conference on Modern Trends in Neutron Activation Analysis, 2011, College Station, TX
- "Dielectric Changes in Neutron Irradiated Lead Zirconate Titanate," National Institute of Nano Engineering Symposium, 2011, Albuquerque, NM
- "Hysteretic Behaviour in Irradiated Ferroelectric Ceramics," Electronic Materials and Applications, 2011, Orlando, FL

## Teaching Experience

- Missouri University of Science and Technology
  - Reactor Operations I (NE2406), Spring semester 2018
  - Advanced Radiation Interactions (NE6001), Fall semester 2017
  - Fusion Fundamentals (NE4361), Spring semester 2017
  - Interactions of Radiation in Matter (NE3103), Spring semester 2017-2018
  - Nuclear Materials (NE4241,5241 MET ENG5170), Fall semester 2016-2017
  - Introduction to Nuclear Engineering (NE2105), Spring semester 2016
  - Nuclear Technology Applications (NE1105), Spring semester 2016
- Teaching Assistant Positions at the University of Texas
  - Concepts in Nuclear and Radiation Engineering, Fall semester 2010
  - Nuclear Environmental Protection, Spring semester 2011
  - Nuclear Reactor Operations and Engineering, Spring semester 2012
  - Concepts in Nuclear and Radiation Engineering, Maymester 2012, TU Delft, the Netherlands
  - Modern Trends in Nuclear and Radiation Engineering, Maymester 2013, TU Delft, the Netherlands

- Lecture Material Authorship
  - Introduced new graduate course in Advanced Radiation Interactions, Missouri University of Science and Technology
  - Developed entirely new course materials for Fusion Fundamentals, Missouri University of Science and Technology
  - Developed entirely new course materials for Interactions of Radiation in Matter, Missouri University of Science and Technology
  - Prepared two instructional learning modules on MCNPX simulations of waste burnup in an accelerator driven system for a course entitled Monte Carlo Methods in Radiation Transport, University of Texas
  - Prepared lectures on introductory nuclear physics, reactor theory and radiochemistry for a Spring class entitled Concepts in Nuclear and Radiation Engineering, University of Texas
  - Prepared a series of five audio-video lectures and 3 video labs for a modular short course sponsored by the US Nuclear Regulatory Commission (NRC) on radiation effects in electronic materials

## **Service and Affiliations**

- Professional Service
  - Member of the American Nuclear Society
  - Member of the Materials Research Society
  - Member of the American Ceramics Society
  - Session chair: Ion Enhanced Synthesis and Modification: Advanced Characterization, 24th International Conference on Accelerator Applications in Research and Industry (CAARI), Ft. Worth, TX
  - Proposal reviewer for the Nuclear Regulatory Commission graduate fellowship grant program
  - Manuscript reviewer for Applied Physics Letters, Journal of Applied Physics and Journal of Radioanalytical and Nuclear Chemistry
- Campus Service
  - Director of the Missouri S&T Nuclear Research Reactor
  - Advisor to the American Nuclear Society Student Chapter at Missouri S&T
  - Member of the campus Radiation Safety Committee
  - Search committee member for three junior faculty searches in 2017 and 2018