

# Allison K. Murray

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## Education

Purdue University | West Lafayette, Indiana

*Doctor of Philosophy, Mechanical Engineering (December 2019)*

- Dissertation: *Exploring the Inkjet Printing of Functional Materials and Their Use in Energetic Systems and Sensing Applications*

*Master of Science, Mechanical Engineering (August 2018)*

*Bachelor of Science, Mechanical Engineering (December 2015)*

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## Professional Experience

Marquette University | Milwaukee, Wisconsin

*Assistant Professor of Mechanical Engineering (2020-Present)*

- Lead a research group focused on additive manufacturing and vibrations
- Study strategies to understand and enhance minoritized student experiences in engineering programs
- Instruct courses including: dynamics and vibrations

Next Offset Solutions, Inc. | West Lafayette, Indiana

*Board of Directors (2017-Present)*

- Contribute to the business development of a research-based startup

*Research Scientist (2017-2020)*

- Consulted on a proprietary 3D printing technology for defense applications

Purdue University | West Lafayette, Indiana

*Post-Doctoral Research Associate (2019-2020)*

- Advised undergraduate and graduate research associates on the development of resonant mass sensor platforms
- Consulted with engineering education team investigating the effects of teaching tools on undergraduate mechanical engineering courses

*Graduate Research Assistant (2016-2019)*

- Improved the predictive capabilities of oscillator-based volatile organic compound sensors
- Developed a first-of-its-kind additive manufacturing system for the selective deposition of energetic materials

*Undergraduate Research Assistant (2014-2016)*

- Designed and built a novel inkjet printing platform for the deposition of functional materials

*Undergraduate Teaching Assistant (2014)*

- Facilitated the Basic Mechanics I and II tutorial room for approximately 1000 students

**Student Engagement**

Marquette University | Milwaukee, Wisconsin

*Assistant Professor, GEEN 2120: Dynamics (Fall 2020)*

- Number of students: 18

Purdue University | West Lafayette, Indiana

*Instructor, ME 274: Basic Mechanics II (Spring 2019)*

- Number of students: 83
- Instructed 3-credit dynamics class with a 4.9/5 instructor rating and 4.4/5 course rating

*Research Mentor (2016-2020)*

- Number of students: 7
- Advised undergraduate students on projects relating to additive manufacturing, structural vibrations, sensor design, and software development
- Undergraduates published 3 journal papers, 1 patent, and 4 conference presentations

*Stamps Scholar Graduate Student Advisor (2016-2020)*

- Number of students: 52
- Advised executive board to develop student-led service initiatives
- Oversaw scholar-led organization of national conference for undergraduates demonstrating excellence in scholarship, leadership, and service

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**Professional Engagement**

- Ray W. Herrick Laboratories Industrial Advisory Meeting Student Chair (2018-2020)
- ASME Student Member (2015-2020)
- Control Engineering Practice Journal Reviewer (2018)
- ASME Dynamic Systems and Control Conference Reviewer (2020)

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**Select Awards and Honors**

Purdue University | West Lafayette, Indiana

*Ward A. Lambert Teaching Fellow (2018-2019)*

- Identified for previous teaching successes and a desire to become a faculty member
- Received instructional training from a renowned educator and taught a course as the instructor-of-record

*William E. Fontaine Graduate Research Fellow (2018-2019)*

- Recognized for meaningful research contributions and engagement with the community

National Defense Industrial Association | Arlington, Virginia

*Women in Defense HORIZONS Scholar (2018)*

- Recognized for contributions to national security through research advancements

Stamps Charitable Foundation | Atlanta, Georgia

*Stamps Scholar (2012-2015)*

- Nationally identified as a student demonstrating excellence in scholarship, leadership, and service

**Accepted Peer-Review Publications**

1. E. R. Westphal, **A. K. Murray**, M. P. McConnell, T. J. Fleck, G. T.-C. Chiu, J. F. Rhoads, I. E. Gunduz, S. F. Son. *The Effects of Confinement on the Prescribed Substrate Fracturing Performance of Printed Nanothermites*. Propellants, Explosives, Pyrotechnics. 2018. 44(1): p. 1-9.
2. **A. K. Murray**, W. A. Novotny, N. Bajaj, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, J. F. Rhoads. *Piezoelectric Inkjet Printed Metallic Igniters*. Journal of Imaging Science and Technology. 2018. 62(4): p. 40406-1-40406-6.
3. **A. K. Murray**, W. A. Novotny, T. J. Fleck, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, and J. F. Rhoads. *Selectively-Deposited Energetic Materials: A Feasibility Study of the Piezoelectric Inkjet Printing of Nanothermites*. Additive Manufacturing. 2018. 22: p. 69-74.
4. M. J. Wadas, M. Tweardy, N. Bajaj, **A. K. Murray**, G. T.-C. Chiu, E. A. Nauman, J. F. Rhoads. *Detection of Traumatic Brain Injury Protein Biomarkers with Resonant Microsystems*. IEEE Sensors Letters. 2017. 1(6): p. 1-4.
5. **A. K. Murray**, T. Isik, V. Ortalan, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, and J. F. Rhoads. *Two-Component Additive Manufacturing of Nanothermite Structures via Reactive Inkjet Printing*. Journal of Applied Physics. 2017. 122(18): p. 184901.
6. T. J. Fleck, **A. K. Murray**, G. T.-C. Chiu, I. E. Gunduz, S. F. Son, and J. F. Rhoads. *Additive Manufacturing of Multifunctional Reactive Materials*. Additive Manufacturing. 2017. 17: p. 176-182.
7. T. J. Fleck, R. Ramachandran, **A. K. Murray**, W. A. Novotny, G. T.-C. Chiu, I. E. Gunduz, S. F. Son, and J. F. Rhoads. *Controlled Substrate Destruction Using Nanothermite*. Propellants, Explosives, Pyrotechnics. 2017. 42(6): p. 579-584.

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**Submitted Peer-Review Publications**

1. M. P. McConnell, **A. K. Murray**, B. W. Boudouris, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, J. F. Rhoads. *Additively Manufactured Conductive Polymer Spark Gap Igniters*. Submitted 2018.
2. **A. K. Murray**, J. R. Meseke, N. Bajaj, J. F. Rhoads. *A Field Programmable Gate Array Controlled Oscillator-Based Sensing Array for Improved Sensing Statistics*. Submitted 2019.
3. J. N. Hodul, **A. K. Murray**, N. F. Carneiro, J. R. Meseke, J. Morris, X. He, D. Zemlyanov, G. Chiu, J. Braun, J. F. Rhoads, B. W. Boudouris. *Modifying the Surface Chemistry and Nanostructure of Carbon Nanotubes Facilitates the Chemically-Selective Detection of Aromatic Hydrocarbon Gases*. Submitted 2020.
4. C. S. Pyles, **A. K. Murray**, D. D. Quinn, J. F. Rhoads. *A Single-Input, Single-Output Multi-Analyte Vapor Sensor Based Upon Reactively Coupled Resonant Elements*. Submitted 2020.

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**Invention Disclosures and Patents**

1. Z. A. Siefker, X. Zhao, N. Bajaj, **A. K. Murray**, G. T.-C. Chiu, B. W. Boudouris, J. F. Rhoads. *A Chemiresistive CO<sub>2</sub> Sensor Based on Carbon Nanotube Functional Polymer Composite Films*. US Provisional Patent. Filed: August 18, 2019. US Patent Application 62/884,390.

2. M. J. Wadas, M. Tweardy, N. Bajaj, **A. K. Murray**, G. T.-C. Chiu, E. A. Nauman, and J. F. Rhoads. *Method of Detecting a Substance*. US Patent. Filed: July 19, 2018. US Patent Application 16/040,504.
3. T. J. Fleck, **A. K. Murray**, S. Son, G. T.-C. Chiu, I. Gunduz, and J. F. Rhoads. *3D Printed Fluoropolymer-based Energetic Compositions*. US Patent. Filed: March 14, 2018. US Patent Application 15/920,509.

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### Conference Abstracts and Presentations

Presenting author indicated by \*

1. Z. A. Siefker\*, **A. K. Murray**, X. Zhao, B. W. Boudouris, N. Bajaj, G. T.-C. Chiu, J. F. Rhoads. *A Resonant CO<sub>2</sub> Sensor Functionalized with a Polymerized Ionic Liquid*. IEEE Sensors. 30 October 2019.
2. **A. K. Murray**, J. R. Meseke\*, N. Bajaj, J. F. Rhoads. *Addressing Sensing Statistics through Oscillator-Based Sensing Arrays*. IEEE Sensors. 28 October 2019.
3. **A. K. Murray**\*, J. R. Meseke, N. Bajaj, J. F. Rhoads. *An FPGA Controlled Oscillator Based Volatile Organic Compound Sensing Array*. ASME International Design Engineering Technical Conferences. 19 August 2019.
4. **A. K. Murray**\*, W. A. Novotny, N. Bajaj, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, J. F. Rhoads. *Piezoelectric Inkjet Printed Metallic Igniters*. Printing for Fabrication 2018. 25 September 2018.
5. **A. K. Murray**\*, L. K. May, G. T.-C. Chiu, J. F. Rhoads. *Modeling the Transverse Vibration of Additively Manufactured Heterogeneous Beams*. ASME International Design Engineering Technical Conferences. 27 August 2018.
6. M. P. McConnell\*, **A. K. Murray**, B. W. Boudouris, J. F. Rhoads. *Inkjet Printed, Conductive Polymer Spark Igniters*. ASME International Design Engineering Technical Conferences. 27 August 2018.
7. **A. K. Murray**\*, L. K. May, G. T.-C. Chiu, J. F. Rhoads. *Exploring the Transverse Vibration of Additively Manufactured Inhomogeneous Beams*. United States National Congress on Theoretical and Applied Mechanics. 8 June 2018.
8. **A. K. Murray**\*, W. A. Novotny, T. J. Fleck, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, J. F. Rhoads. *Two-Component Additive Manufacturing of Nanothermite by Reactive Inkjet Printing*. American Physical Society, Shock and Compression of Condensed Matter. 13 July 2017.
9. **A. K. Murray**\*, W. A. Novotny, T. J. Fleck, I. E. Gunduz, S. F. Son, G. T.-C. Chiu, J. F. Rhoads. *Piezoelectric Inkjet Printing as a Method for the Selective Deposition of Energetic Material*. Society of Experimental Mechanics, Annual Conference. 15 June 2017.