William J. Costakis, Jr.

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EDUCATION

Purdue University, West Lafayette, IN August 2015 – Present
Thesis Research: *Processing and Mechanical Evaluations of Pressurelessly Sintered Ultra-High Temperature Ceramic Composites*
Doctorate of Philosophy, Materials Science and Engineering
GPA: 3.77/4.0

Purdue University, West Lafayette, IN August 2013 – May 2015
Bachelor of Science, Materials Science and Engineering
GPA: 3.63/4.0

Wabash College, Crawfordsville, IN August 2009 – May 2013
Bachelor of Arts, Major: Physics, Minor: Mathematics
GPA: 3.44/4.0

RESEARCH EXPERIENCE

Processing and Mechanical Evaluations of Sintered (without the use of pressure) Ultra-High Temperature Ceramic Composites August 2015 – Present
Purdue University

- Working to develop a robust approach to fabricate UHTCCs capable of >1500^{o}C service, without the use of an externally applied load during sintering, that demonstrate the requisite energy absorbing properties required of a composite structure and a flexure strength of 300 MPa

Additive Manufacturing of Boron Carbide via Continuous Filament Direct Ink Writing of Aqueous Ceramic Suspensions May 2014 – August 2015
Army Educational Outreach Program and Army Research Office

- Selected to participate in Undergraduate Research Apprenticeship Program at Purdue University
- Established processing methods for highly loaded boron carbide ceramic suspensions, used additive manufacturing process to fabricate complex 3-dimenional structures out of new materials, characterized the rheological behavior of boron carbide suspensions along with microstructural and mechanical properties of robocast specimens
- Mentored student in the High School Apprenticeship Program, worked with team of graduate students on multiple projects, first author on the published article [1]

Physical Metallurgy of Selected Zirconium Alloys August 2014 – May 2015
GE/Hitachi and Purdue University

- Conducted project to characterize and establish secondary phases of selected zirconium alloy for use in nuclear fuel channel systems, developed experimental heat treatment methods to model manufacturing process
- Obtained training and demonstrated competence to individually use multiple analytical and microstructural characterization techniques, such as SEM (scanning electron microscopy), TEM (transmission electron microscopy), STEM(scanning transmission electron microscopy) FIB (focused ion beam), TGA (thermal gravimetric analysis), DSC (differential scanning calorimetry), XRD (X-ray diffraction), and XRF (X-ray fluorescent), to properly obtain information on phases and structures
- Reported to a team of Global Nuclear Fuel and GE/Hitachi engineers, lead bi-monthly conference calls with sponsor and teammates, managed project by discussing tasks and organized samples for preparation and characterization

Fabrication of Complex-shaped Ceramic Components By Room-temperature Injection Molding of Ceramic Suspension Gels August 2014 – May 2015
Purdue University

- Prepared and optimized highly loaded alumina ceramic suspensions for use in room temperature 3-D printing, worked with other students to construct fully enclosed complex three dimensional objects and substrates by using a dual injector printing program
- Employed computer code to enhance 3-D printer performance and to obtain desired printed samples, performed rheology tests to further characterize and optimize ceramic suspensions
- Funded by the Army Research Office (Grant #W911NF-13-1-0425), under the direction of Professors Rodney Trice and Jeffrey Youngblood, second author on the published article [2]

Construction of Direction Sensitive Scintillator-bar Muon Detector January 2011 – May 2011
Wabash College

- Designed and fabricated experimental set up, helped write Monte-Carlo simulation in Wolfram Mathematica to model muon signal detection, collected data on time delay response between two muon pulses to identify the traveling direction and angle of muons

Acoustical Fracture Signals in Steel Reinforced Concrete Beams August 2010 – January 2011
Wabash College

- Worked to predict failure by fracture in steel reinforced concrete beams through acoustic emission monitoring
- Developed standard procedure to mix and pour concrete beams, calibrated piezoelectric sensors and camera for analysis

Characterization of Spatial Light Modulator for Holographic Displays August 2010 – January 2011
Wabash College

- Developed program based on Fourier transforms to make diffraction gratings with Spatial Light Modulator for manipulation of incident HeNe laser, analyzed multiple far field images to gauge the ability of the input and output functions

WORK EXPERIENCE

Materials Science and Engineering Teaching Assistant January 2016 – May 2016
Purdue University, West Lafayette

- Taught a sophomore level material science class titled “Structure and Properties of Materials”, individually taught and lead 2 separate recitation sessions each week consisting of roughly 40 students
- Developed weekly quizzes, held office hours for 2 hours per week to further offer help with homework and difficult material, collaborated with the professor to grade homework assignments and exams

Metallurgical Engineer Internship May 2014 – August 2014
Arcelor Mittal, Indiana Harbor

- Worked with Operations and Technology department at the 84’ Hot Strip Mill located at Indiana Harbor, assigned to a team composed of 7 engineers from the Quality, Research, and Operations and Technology departments to develop and propose an argument for an upgraded water cooling system, provided substantial evidence that coiling temperature requirements where not being fulfilled
- Characterized microstructure of new steel grade for an X70 line pipe trial, preformed stereographic techniques, and used an optical microscope and SEM (scanning electron microscope) to format a report for a group of research engineers
- Characterized the microstructure of new press hardening steel to be used in anti-intrusion automotive parts, presented and discussed findings with lead engineers at the global Research and Development department

- Developed a standard procedure to calibrate the X-ray gauge device, analyzed past data to collect steel grades with relative gauge errors, worked with lead research engineer to update the database of parent chemistries for new advanced steel grades

Physics Tutor August 2012 – May 2013
Wabash College
- Taught the fundamentals of physics to students, established a comfortable learning environment, worked with other tutors to effectively convey concepts and ideas

Physics Grader August 2011 –December 2013
Wabash College
- Graded physics homework 3 times a week, collaborated with the professor to ensure the proper grades were fairly distributed

LEADERSHIP
MSE Graduate Student Association
Outreach Co-Chair: May 2016 – Present
- Organizing and participating in materials science outreach events, presenting materials science demonstrations to younger students in the community, leading demonstrations to inform high school teachers on ways to integrate materials sciences projects into their course curriculum

Purdue Climbing Club
Vice President: August 2015 – December 2015
- Worked to start a new climbing club at Purdue, organized bi-weekly training sessions, attended and competed in monthly competitions, hosted community climbing events each week, and recruited new students to become active members

Treasurer: January 2015 – Present
- Managing financial accounts, invited and arranged for guest speakers to come and talk about climbing culture, safety, and training, consulted with the executive board for improvement of the scheduled events and training

Purdue University Materials Advantage, Safety Chair January 2014 – May 2015
- Organized subcommittee of students to inspect labs, worked with graduate students and professors to develop safety procedures and insure that the workspace was usable and safe for the introduction of new etchants, such as hydrofluoric acid
- Lead outreach events to introduce diverse groups of students (middle school and high school) to materials engineering, planned and preformed hands on material science demonstrations, collaborated with Purdue Baja SAE club by offering materials solutions to real world problems

Resident Assistant March 2010- May 2013
Wabash College
- Managed resident hall floor consisting of 40 students, co-managed dormitory building containing 200 students, strengthened student participation in campus activities, built personal bonds through mentoring students
- Collaborated with other RAs to improve training tailored to specific problems involving alcohol and other substances
- Learned how to lead effectively through respect, tend to students with different backgrounds and needs by managing living units with differently orientated atmospheres each year

Rugby Club
Wabash College
President: August 2012 – May 2013

- Established a climate of enthusiasm through diverse practice activities, demonstrated leadership through student lead practices, requested input to explore alternatives before making important decisions and worked with the needs of the players
- Developed better communication skills through constant contact with league officials to better facilitate matches, gained respect from team members by demonstrating commitment and hard work

Treasurer: December 2010 – May 2012

- Managed financial account, arranged for the purchase of new uniforms for the team, directed the affairs of the referees, consulted with the faculty advisor, president, and match coordinator for improvement of the schedule and allocations

Malcolm X Institute of Black Studies August 2011 – May 2012
Wabash College
Chair:

- **KQ&K Tutoring and Mentoring Program:** Individually tutored and worked with 18 children from the Crawfordsville Elementary and Middle schools twice a week, organized transportation to and from the tutoring facilities

Co-Chair:

- **Academic Board:** Provided academic support for members, worked with a group to academically involve students, developed quizzes to cognitively challenge others

W.A.R. Council (Wabash Acts Responsibly), Vice President January 2009 – December 2010
Wabash College

- Organized campus wide events to influence students to make responsible choices with alcohol and other drugs, developed new ideas to inform students about drug abuse, such as Root Beer Socials, drunken driving simulator, and brew offs

MEMBERSHIPS
MSE Graduate Student Association (Outreach Volunteer)
Purdue University August 2015 – May 2016

- Volunteered to lead and participate in outreach events consisting of materials science demonstrations presented to middle and high school students from programs such as the Minority Engineering Program's Summer Engineering Workshop, the Seminar for Top Engineering Prospects (STEP) program, the 4-H community, and MSE 190 students
- Gave laboratory tours for Purdue's Recruitment of Multi-Ethnic students interested in the Schools of Engineering (PROMISE), participated in Nanodays (campus wide event) that promoted science and engineering to K-12 and young female students

National Materials Advantage Member August 2013 – Present
Purdue University

- Memberships in TMS, AIST, ACerS, and ASM

ACerS

- President's Council of Student Advisors (PCSA) June 2016 – Present

AFS (American Foundry Society), Member January 2014 – May 2015
Purdue University

- Participated in casting nights, plant tours, and casting competition

Alpha Phi Omega, **Member** August 2010 – May 2011
Wabash College

- Community service fraternity; Participated in community service projects consisting of blood drives, Special Olympics, and Habitat for Humanity

CONFERENCE ATTENDANCE

Materials Science and Technology (2013) Montreal, Quebec
Materials Science and Technology (2014) – Student Monitor Pittsburgh, PA
Materials Science and Technology (2015) Columbus, OH
International Conference and Exposition on Advanced Ceramics and Composites (2016) Daytona Beach, FL

PROFESSIONAL DEVELOP ACTIVITIES

Materials Advantage Congressional Visit Day (2015) Washington, DC
ACER's Winter Workshop (2016) Orlando/Daytona Beach, FL
Materials Advantage Congressional Visit Day (2016) Washington, DC

POSTER/PRESENTATIONS

(2016) **W.J. Costakis Jr.**, L.M. Rueschhoff, A.A. McEachen, A.I. Diaz-Cano, J.P. Youngblood, R.W. Trice, "Additive Manufacturing of Boron Carbide via Continuous Filament Direct Ink Writing of Aqueous Ceramic Suspensions", presentation at the 40th International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2016), Daytona Beach, FL.

(2012) M. J. Madsen, L. Rice, **W. Costakis Jr**, "Characterization of Spatial Light Modulator for Holographic Displays" presented at The Wabash College Celebration of Student Research, Scholarship and Creative Work, Crawfordsville, IN.

(2013) J. Brown, B. Foster, **W. Costakis Jr,** Y. Tang "Construction of Direction Sensitive Scintillator-bar Muon Detector" presented at The Wabash College Celebration of Student Research, Scholarship and Creative Work, Crawfordsville, IN.

RESEARCH PAPERS

[1] **W.J. Costakis**, L.M. Rueschhoff, A.I. Diaz-Cano, J.P. Youngblood, R.W. Trice, Additive manufacturing of boron carbide via continuous filament direct ink writing of aqueous ceramic suspensions, J. Eur. Ceram. Soc. 36 (2016) 3249–3256. doi:10.1016/j.jeurceramsoc.2016.06.002.

[2] L.M. Rueschhoff, **W.J. Costakis**, M.J. Michie, J.P. Youngblood, R.W. Trice, Additive Manufacturing of Dense Ceramic Parts via Direct Ink Writing of Aqueous Alumina Suspensions, Int. J. Appl. Ceram. Technol. (2016). doi:Accepted May 24th, 2016.

Wabash Journal of Physics

M. J. Madsen, L. C. Rice, **W. Costakis Jr.**. (2011). *Characterization of Spatial Light Modulator*. Wabash Journal of Physics.

M. J. Madsen, E. Groninger, **W. Costakis Jr.**. (2011). *Predicting a Steel-Reinforced Concrete Beam Failure Using Acoustic Emissions Monitoring*. Wabash Journal of Physics.

J. Brown, **W. Costakis Jr.,** Y. Tang. (2012). *Monte-Carlo Simulation to Model Muon Event in Direction Sensitive Scintillator-bar*. Wabash Journal of Physics.

J. Brown, B. Foster, **W. Costakis Jr.,** Y. Tang. (2012). *Construction of Direction Sensitive Scintillator- bar Muon Detector*. Wabash Journal of Physics.