

**William J. Costakis, Jr.**  
910 N Tippecanoe, Lafayette, IN 47904  
(219) 616-8544 (cell) – wcostaki@purdue.edu

## EDUCATION

**Purdue University**, West Lafayette, IN Expected Graduation: May 2020  
Thesis Research: *Processing of transparent ceramics via alignment of  $\alpha$ -alumina platelets*  
Doctorate of Philosophy, Materials Science and Engineering  
GPA: 3.67/4.0

**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 of Transparent Ceramics via Alignment of  $\alpha$ -alumina Platelets** August 2017-Present  
Purdue University  
Graduate research assistant

- Using ceramic and polymer blending techniques to make formable ceramic-filled media that can be used in processes that take advantage of shear and elongational flow stresses
- Characterizing the rheological properties of ceramic-filled thermoplastic blends and relating these properties to the final platelet alignment of samples through rocking curve analysis [1] [2]

**Alignment of Alumina Fibers Via Direct Ink Writing** May 2019 – August 2019  
Army Educational Outreach Program and Army Research Office  
Graduate research assistant

- Mentored two students in the Undergraduate Research Apprenticeship Program and High School Apprenticeship Program, developed research goals and guided the overall progress of the project
- Developed ceramic suspensions with oxide fibers to use with additive manufacturing processes and performed dilatometry to characterize the sintering kinetics of the different fiber loadings

**Alignment of  $\alpha$ -Alumina Platelets for Transparency Via Direct Ink Writing** May 2018 – August 2018  
Army Educational Outreach Program and Army Research Office  
Graduate research assistant

- Co-led the candidate selection process, mentored an undergrad and a high school student
- Characterized the rheological behavior of alumina suspensions with platelet additions, hot-pressed samples to transparency, used rocking curve analysis to obtain quantifiable texture distribution

**Development of UV-curable Ceramic (Boron Carbide, Silicon Carbide and Alumina) Suspensions for Stereo Lithography Based Additive Manufacturing** May 2017 – August 2017  
Army Research Laboratory  
Awardee: ORISE Fellowship

- Developed preliminary UV-curable ceramic suspensions for stereo lithographic additive manufacturing process, characterized powders through BET analysis and zeta potential
- Performed UV curing studies, thermal gravimetric analysis (TGA), and Fourier-transform infrared spectroscopy (FTIR) to characterized suspensions,
- Finalist in the ARL Armor branch “Summer Research Presentation Competition”

## **Processing and Mechanical Evaluations of Sintered UHTC Composites**

August 2015 – August 2017

Purdue University

Graduate research assistant

- Developed processing science to fabricate UHTCCs capable of >1500°C service without the use of an externally applied load during sintering
- Developed ceramic and polymer blending technique for SiC and ZrB<sub>2</sub>, performed initial sintering and sintering aid investigation

## **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

Awardee: Summer Undergraduate Research Apprenticeship Program at Purdue University

- Established and fabricated highly loaded boron carbide ceramic suspensions and used additive manufacturing process to fabricate near-net shaped samples
- Connected the rheological behavior (yield stress and gel strength) to printability [3]

## **Physical Metallurgy of Selected Zirconium Alloys**

August 2014 – May 2015

GE/Hitachi and Purdue University

Undergraduate research assistant

- Characterized secondary phases of selected zirconium alloy for use in nuclear fuel channel systems and developed experimental heat treatment methods to model manufacturing process
- Training and proficiency in the use of TEM (transmission electron microscopy), STEM (scanning transmission electron microscopy), FIB (focused ion beam), DSC (differential scanning calorimetry), and XRF (X-ray fluorescence spectroscopy)

## **Fabrication of Complex-shaped Ceramic Components via Direct Ink Writing of Aqueous Ceramic Suspensions**

August 2014 – May 2015

Purdue University

Undergraduate research assistant

- Optimized highly loaded alumina ceramic suspensions for use in direct ink writing, developed computer code to enhance printer performance
- Performed rheological analysis to characterize ceramic suspensions and connected rheological properties (yield strength) to printability [4]

## **Metallurgical Engineer Internship**

May 2014 – August 2014

Arcelor Mittal, Indiana Harbor

Summer intern

- Characterized the microstructure of new press hardening steels to be used in anti-intrusion automotive parts and presented findings to lead engineers at the global R&D department
- Developed a standard procedure to calibrate the X-ray gauge device and updated the database with parent chemistries for new advanced steel grades

## **Construction of Direction Sensitive Scintillator-bar Muon Detector**

January 2011 – May 2011

Wabash College

Undergraduate research assistant

- Designed and fabricated muon detector from scintillator bars, developed a 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

## POSTER/PRESENTATIONS

(2019) **William Costakis Jr.\***, Andrew Schlup, Prof. Jeffrey Youngblood, Prof. Rodney Trice, "Aligning  $\alpha$ -Alumina Platelets via Shear/Elongational Flows Using Thermoplastic Polymers for the Improvement of Final Sintered Transparency", Oral presentation at the 43th International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2019), Daytona Beach, FL.

(2019) Andrew Schlup\*, **William Costakis Jr.**, Prof. Rodney Trice, Prof. Jeffrey Youngblood, " Hot Pressing Platelet Morphology  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> : Effect of Processing Parameters and Particle Alignment ", Oral presentation at the 43th International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2019), Daytona Beach, FL.

(2018) Andrew Schlup\*, **William Costakis Jr.**, Prof. Rodney Trice, Prof. Jeffrey Youngblood, "Aligning  $\alpha$ -Alumina Platelets via Shear/Elongational Flows for Improved Transparency: Processing and Preliminary Results", Oral presentation at the 42th International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2018), Daytona Beach, FL.

(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", Oral presentation at the 40th International Conference and Exposition on Advanced Ceramics and Composites (ICACC 2016), Daytona Beach, FL.

(2015) L. Rueschhoff\*, **W. Costakis**, M. Michie, A. Diaz-Cano, J. Youngblood, R. Trice "Manufacturing Complex-Shaped Ceramic Components through Room-Temperature Robocasting of Ceramic Suspension Gels (CeraSGels)" Oral Presentation at MS&T, Columbus, OH.

## RESEARCH PAPERS

- [1] **W.J. Costakis**, A.P. Schlup, J.P. Youngblood, R.W. Trice, Aligning  $\alpha$ -Alumina Platelets via Uniaxial Pressing of Ceramic-filled Thermoplastic Polymer Blends for the Improvement of Final Sintered Transparency, "In preparation" (2019).
- [2] A.P. Schlup, **W.J. Costakis**, W. Rheinheimer, R.W. Trice, J.P. Youngblood, Hot-Pressing Platelet Alumina to Transparency, J. Am. Ceram. Soc. Accepted (2019).
- [3] **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.
- [4] L. Rueschhoff, **W. Costakis**, M. Michie, J. Youngblood, R. Trice, Additive Manufacturing of Dense Ceramic Parts via Direct Ink Writing of Aqueous Alumina Suspensions, Int. J. Appl. Ceram. Technol. (2016).

## LEADERSHIP

### ACerS President's Council of Student Advisors

October 2016 – October 2018

- Worked with a student-led committee to facilitate industry-student relations, promoted ceramic science and engineering at the university and local levels, and implement ceramics-focused outreach activities on a national and international level
- Helped develop a new student run demonstration competition for graduate and undergraduate students, involved in the programming committee (2016-17) and the external partnership committee (2017-18)

**ACerS Winter Workshop Organizing Committee Member:** October 2017 – Present

- Involved in the organizing and planning of the 2018/2019/2020 ACerS Winter Workshop, worked with a team of young professionals and administrative staff to invite distinguished speakers from different ceramic research fields to give presentations to attendees

### **MSE Graduate Student Association**

Outreach Co-Chair: May 2016 – August 2017

- Organized, led, and participated in materials science outreach events, performed demonstrations to students in the Minority Engineering Program, the Seminar for Top Engineering Prospects (STEP) Program, the 4-H community, Space day, Nano days, and local schools
- Worked with a program designed to help high school teachers integrate materials sciences projects into course curriculum, created videos of educational demonstrations in multiple languages to accommodate a global student and teacher audience

**Purdue Women in Engineering Program (WIEP)** May 2016 – August 2017

- Participated in the WIEP summer and fall ACCESS leadership program, led hands on engineering activities at local summer programs (K-8th grade residential and day camps), encouraged younger children to participate in engineering-based activities through challenging outreach activities

**Materials Science and Engineering Teaching Assistant** January 2016 – May 2016

Purdue University, West Lafayette

Teaching Assistant

- Class titled “Structure and Properties of Materials”, individually taught 2 separate recitation sessions (roughly 40 students), developed weekly quizzes, held office hours, graded homework assignments and exams

### **Purdue Climbing Club**

President: January 2016 – January 2017

Treasurer: January 2015 – January 2016

Vice President: August 2015 – December 2015

**Purdue University Material Advantage Safety Chair** January 2014 – May 2015

- Organized subcommittee of students to inspect labs, worked with graduate students and professors to develop safety procedures
- Led outreach events to introduce diverse groups of students (middle school and high school) to materials engineering, planned and performed hands on material science demonstrations

## **PROFESSIONAL DEVELOPMENT ACTIVITIES**

Materials Science and Technology (2013-17)

- (2014) – Student Monitor
- (2016) – PCSA Delegate, Salt Lake City, UT
- (2017) – PCSA Delegate, Pittsburgh, PA

International Conference and Exposition on Advanced Ceramics and Composites (2016,2018-19)

- (2016, 2018-19) – ACerS Winter Workshop (2016), Daytona Beach, FL

Material Advantage Congressional Visit Day (2015-16)