

EDUCATION

Ph.D. Materials Engineering, Purdue University

Aug. 2012 – Present

Thesis: Designing hierarchical porous, biodegradable materials for orthopaedic fracture fixation implants

Advisor: Dr. Lia Stanciu (GPA: 3.79)

NSF 2014 Fellowship in Materials Engineering

Curriculum Focus: Biocomposite implant development; tissue-material interactions; metal corrosion properties; metallurgical processing and deformation, development of porous materials

B.S. Material Science & Engineering, Washington State University

May 2012

Advisor: Dr. David Field (GPA: 3.52)

Minor in Mechanical Engineering

EXPERIENCE

Graduate Research Assistant with Dr. Lia Stanciu

Aug. 2012 – Present

Purdue University- School of Material Science Engineering

- Developed and tested cast and sintered Fe-Mn alloys for *in vitro* and *in vivo* corrosion experiments
- Applied a wide range of deformation processes (SPD) to Fe-Mn alloys to enhance degradation
- Generated hierarchical porous surfaces using dealloying to improve cell attachment
- Established an innovative design to create resorbable, porous Fe-Mn-Hydroxyapatite biocomposites
- Investigated methods to tailor the mechanical properties and degradation rates of Zn-Mg alloys
- **Preliminary Exam:** Critical Review on the “Development of metal-on-metal hip implant bearing surfaces to reduce wear debris”
- Mentored undergraduate research assistants towards data analysis suitable for journal publication

Technical Instructor for MSE 335: Material Characterization Techniques

Fall 2013 & Fall 2015

Purdue University- School of Material Science Engineering

- Led weekly recitation lectures and multiple lab sections per week
- Instructed students on the fundamentals of SEM and developed their hands-on laboratory skills

Technical Assistant for Undergraduate Research with Dr. David Field

Jan. 2010-May 2012

Washington State University- School of Mechanical & Material Science Engineering

- Designed an equal-channel angle extrusion (ECAE) die capable of SPD of Mg alloys
- Characterized the refinement of grains and texture development of severe plastically deformed alloys

Senior Design Project: Transport for Nonproliferation Radiation Detection Equipment

Aug. 2011

Pacific Northwest National Lab

- Designed and built a mobile cart for nuclear radiation detector transport to measure the concentration of U235 in UF6 containers; safeguarding the nonproliferation of nuclear material

Aerospace Quality Engineering Intern

Summers of 2010, 2011, 2012

Exotic Metals Forming Company LLC

- Evaluated diverse sets of cobalt and titanium alloy parts while designing quality plans for hardware employed in various aerospace applications

RELATED EXPERIENCE

- Proficient in metal casting, deformation, machining, sintering, surface treatments, & ceramic processing
- Trained in cell culture, corrosion testing, fluorescence microscopy, & MTS Assay
- Trained in tensile & compression tests, SEM (EDS, EBSD, and BSE); AFM, XRD, & nanoindentation

PEER REVIEWED JOURNAL PUBLICATIONS

- (In press) **Heiden, M.** Johnson, D. Stanciu, L. Enhancement of bone marrow stromal cell attachment and degradation rate for nanoporous, dealloyed, bioresorbable Fe-Mn and Fe-Mn-Zn alloys. *Acta Biomaterialia*.
- (In press) **Heiden, M.** Johnson, D. Stanciu, L. Surface modifications through dealloying of Fe-Mn and Fe-Mn-Zn alloys developed to create tailorable, nanoporous, bioresorbable surfaces. *Acta Materialia*.
- **Heiden M.** Walker E. Stanciu L. Magnesium, Iron and Zinc Alloys, the Trifecta of Bioresorbable Orthopaedic and Vascular Implantation – A Review. *J Biotechnol Biomater*, 5, (2015) doi:10.4172/2155-952X.1000178
- **Heiden, M.** Kustas, A. Chaput, K. Nauman, E. Johnson, D. Stanciu, L. Effect of microstructure and strain on the degradation behavior of novel bioresorbable iron-manganese alloy implants. *J. Biomed. Mater. Res. A* 1–8, (2014) doi:10.1002/jbm.a.35220
- **Heiden, M.** Walker, E. Nauman, E. & Stanciu, L. Evolution of novel bioresorbable iron-manganese implant surfaces and their degradation behaviors in vitro. *J. Biomed. Mater. Res. A* 1–9, (2014) doi:10.1002/jbm.a.35155
- Young, J. Askari, H. Hovanski, Y. **Heiden, M.** & Field, D. Thermal Microstructural Stability of AZ31 Magnesium after Severe Plastic Deformation. *Mater. Charact.* **101**, 9–19 (2014) doi: 10.1016/j.matchar.2014.12.026

PROFESSIONAL DEVELOPMENT AND CONFERENCES

- **Heiden, M.** Kustas, A. Chaput, K. Johnson, D. Nauman, E. Stanciu L. *Bioresorbable Iron-manganese for Implantation: The Effect of Microstructure and Surface Morphology on Degradation Behavior*. **MS&T2014**, Pittsburgh, PA.
- **Heiden, M.** Huang, S. Nauman, E. Johnson, D. Stanciu L. *Development of Hierarchical Porosity in Resorbable, FeMn+HA Biocomposites Using Leaching and Dealloying Techniques*. **MS&T2015**, Columbus, OH.

DISCLOSURES AND PATENTS

- Nauman, E. Stanciu, L. **Heiden, M.** Dehestani, M. *Bioresorbable Porous Biocomposites for Orthopaedic Applications*; US Provisional Patent No. 62193776 filed July 17, 2015

ACTIVITIES AND AWARDS

- **National Science Foundation Graduate Research Fellowship (2014-2017)**: Three year fellowship support used towards: Dealloying Bioresorbable Biomaterials to Produce Nanoporous Structures
- **MSE Outreach Instructor (2013-present)**: Actively provide high school students with hands-on experiments in material science engineering to help broaden student knowledge of STEM field education
- **Research Mentor (2012-2013)**: students for the “Summer Undergraduate Research Fellowships” (SURF) program to design and conduct experiments. Taught how to efficiently analyze data suitable for journal publication.
- **Member of Material Advantage (ACerS, AIST, ASM, TMS) (Member since 2009)**: Worked to advance the knowledge of STEM fields across Washington state and built material kits to educate high-school students
- **Ross Fellowship (2012)**: Awarded to high achieving graduate students in MSE at Purdue University
- **Kaiser Scholarship (2009-2011)**: Awarded to high achieving undergraduate students in MSE at WSU
- **Presidential Scholarship of Excellence (2009)**: Awarded to transfer students who have leadership potential
- **Tau Sigma Honor Society (2009-2012)**: Achieved recognition and academic excellence for high achievement