

DINC ERDENIZ

Department of Materials Science and Engineering
Northwestern University
2220 Campus Drive, Evanston, IL 60208

d-erdeniz@northwestern.edu
Phone: (847) 467-2595
Fax: (847) 491-7820

CURRENT APPOINTMENT

Postdoctoral Fellow, June 2011 – present
Department of Materials Science and Engineering
Northwestern University, Evanston, IL, USA
Advisor: Prof. David C. Dunand

EDUCATION

Northeastern University, Boston, MA
Doctor of Philosophy in Mechanical Engineering (Concentration in Materials Science), 2011
Dissertation: Characterization and Modeling of the Early-Stage Reactions in Aluminum-Nickel Composites Produced by Ultrasonic Powder Consolidation

Bogazici University, Istanbul, Turkey
Master of Science in Mechanical Engineering (Concentration in Materials Science), 2008
Thesis: The Precipitate Evolution in the Nickel-based Superalloy IN738LC

Ege University, Izmir, Turkey
Bachelor of Science in Mechanical Engineering, 2005

RESEARCH EXPERIENCE

Postdoctoral Fellow, Northwestern University, Evanston, IL **6/2011 – present**

- Working on a collaborative Ni-based superalloy research project with teams from Northwestern University, Johns Hopkins University, Case Western Reserve University, Naval Research Laboratories, and Saertex USA
- Developing micro-architected Ni-based superalloys for potential use in gas turbines as structural components
- Alloying woven or braided Ni-Cr wires with Al and Ti to create oxidation- and creep-resistant superalloys with open porosity
- Characterizing superalloy specimens by microscopy, micro-hardness, 3-point bending, and creep testing
- Patented a new transient-liquid phase bonding technique for Ni-based wires which enables the bond regions and parent material to have the same composition and properties
- Developing castable, precipitation-strengthened Al alloys for high temperature applications
- Using atom probe tomography to investigate the evolution of nano-precipitates in Al alloys
- Investigating the wire size effect on the formation and evolution of Kirkendall pores in Ti-coated Ni wires during homogenization to equiatomic NiTi shape memory composition
- Bonding 3D-woven, shape memory NiTi wires using a NiTi/Nb slurry
- Studying the sintering behavior of 3D printed Ni and NiTi specimens

Research Assistant, Northeastern University, Boston, MA

1/2008 – 4/2011

- Successfully produced Al-Ni reactive composite materials via a novel ultrasonic powder consolidation technique performed at temperatures 50% lower than conventional methods preventing any reactions between constituent materials
- Conducted metallographic and thermal analysis to study the solid-state exothermic reactions occurring at various temperatures
- Used X-ray diffraction to determine the early-stage phase evolution mechanisms
- Modeled early-stage reaction kinetics of various Al-Ni nano-composites

Research Assistant, Bogazici University, Istanbul, Turkey

9/2005 – 12/2007

- Applied various heat treatments to the Ni-based superalloy IN738LC and investigated multi-modal precipitate evolution mechanisms
- Used digital image analysis to obtain size and volume fraction of gamma-prime precipitates at different stages of precipitation
- Completed the proposed research within the deadline and published two journal papers

RESEARCH INTERESTS

Nickel-based superalloys; Aluminum alloys; High entropy alloys; Shape memory alloys; Porous metals; Micro-architected structures; Casting; Powder metallurgy; Additive manufacturing; Mechanical properties; Advanced materials characterization

GRANT PROPOSALS

- Co-wrote together with A.E. Paz y Puente and D.C. Dunand (PI), a proposal entitled “Size Effect on the Evolution of Kirkendall Pores in Ti-Coated Ni Wires,” funded by NSF, Division of Materials Research, DMR-16-11308, \$396,789, 09/2016 – 08/2019

INTELLECTUAL PROPERTY

1. D.C. Dunand, **D. Erdeniz**, “Transient liquid phase bonding of Ni-based alloys by forming an Al-Ti coating and subsequent heat treatment,” U.S. Patent App. No. 14/592,503 (2014)

LIST OF PUBLICATIONS

1. **D. Erdeniz**, T.A. Schaedler, D.C. Dunand, “Deposition-Based Synthesis of Ni-Based Superalloy Microlattices,” *Scripta Materialia* (2017) under review
2. **D. Erdeniz**, W. Nasim, J. Malik, A.R. Yost, S. Park, A. De Luca, N.Q. Vo, I. Karaman, B. Mansoor, D.N. Seidman, D.C. Dunand, “Effect of Vanadium Micro-Alloying on the Microstructural Evolution and Creep Behavior of Al-Er-Sc-Zr-Si Alloys,” *Acta Materialia* 124 (2017) 501-512
3. A.E. Paz y Puente, **D. Erdeniz**, J.L. Fife, D.C. Dunand, “In situ X-ray Tomographic Microscopy Study of Kirkendall Pore Formation and Evolution during Homogenization of Pack-Aluminized Ni-Cr Wires,” *Acta Materialia* 103 (2016) 534-546
4. **D. Erdeniz**, K.W. Sharp, D.C. Dunand, “Transient Liquid-Phase Bonded Ni-Based Woven Superalloys,” *Scripta Materialia* 108 (2015) 60-63

5. T. Philippe, **D. Erdeniz**, D.C. Dunand, P.W. Voorhees, “A Phase Field Study of the Aluminizing of Nickel,” *Philosophical Magazine* 95 (2015) 935-947
6. **D. Erdeniz**, A.J. Levinson, K.W. Sharp, D.J. Rowenhorst, R.W. Fonda, D.C. Dunand, “Pack Aluminization Synthesis of Superalloy 3D Woven and 3D Braided Structures,” *Metallurgical and Materials Transactions A* 46A (2015) 426-438
7. L. Zhao, S. Ha, K.W. Sharp, A.B. Geltmacher, R.W. Fonda, A. Kinsey, Y. Zhang, S. Ryan, **D. Erdeniz**, D.C. Dunand, K.J. Hemker, J.K. Guest, T.P. Weihs, “Permeability measurements and modeling of topology-optimized metallic 3D woven lattices,” *Acta Materialia* 81 (2014) 326-336
8. **D. Erdeniz**, D.C. Dunand, “Microstructure Development during Pack-Aluminization of Nickel and Nickel-Chromium Wires,” *Intermetallics* 50 (2014) 43-53
9. **D. Erdeniz**, T. Ando, “Fabrication of Micro/Nano Structured Aluminum-Nickel Energetic Composites by Means of Ultrasonic Powder Consolidation,” *International Journal of Materials Research* 104 (2013) 386-391
10. Z. Gu, Q. Cui, J. Chen, J. Buckley, T. Ando, **D. Erdeniz**, P.Y. Wong, A. Hadjiafxenti, P. Epaminonda, I.E. Gunduz, C.G. Rebholz, C.C. Doumanidis, “Fabrication, Characterization, and Applications of Novel Nanoheater Structures,” *Surface and Coatings Technology* 215 (2013) 493-502
11. **D. Erdeniz**, T. Ando, “Characterization of Al-Ni Composites Produced by Ultrasonic Powder Consolidation,” *Proceedings of the 2011 TMS Annual Meeting* (2011) 553-559
12. J. Chen, J. Pelealuw, Z. Gu, Q. Cui, T. Ando, **D. Erdeniz**, P.Y. Wong, “Industrial Safety of Nanoheaters: Enhanced Fabrication Methods, Ignition Characteristics, and Solid-State Reaction Modeling,” *Proceedings of the NSF CMMI Engineering Research and Innovation Conference* (2011)
13. E. Balikci, **D. Erdeniz**, “Multimodal Precipitation in the Superalloy IN738LC,” *Metallurgical and Materials Transactions A* 41A (2010) 1391-1398
14. **D. Erdeniz**, G. Gulsoy, D. Colanto, T. Ando, “Ignition Characteristics of Aluminum-Nickel Heterostructures Produced by Ultrasonic Powder Consolidation,” *Proceedings of the 2010 TMS Annual Meeting* (2010) 729-736
15. J. Chen, J. Pelealuw, Z. Gu, Q. Cui, T. Ando, **D. Erdeniz**, P.Y. Wong, “Industrial Safety of Nanoheaters: Understanding effects of manufacturing parameters on ignition and heat output,” *Proceedings of the NSF Engineering Research and Innovation Conference* (2009)
16. **D. Erdeniz**, E. Balikci, “Precipitate Formation and Evolution in the Superalloy IN738LC,” *Rare Metal Materials Engineering* 38 (2009) 142-146
17. D. Colanto, **D. Erdeniz**, G. Gulsoy, I.E. Gunduz, T. Ando, P.Y. Wong, C.C. Doumanidis, “Ultrasonic Consolidation of Pure Al and Composite Al-Ni Powder Compacts,” *Proceedings of the Materials Science and Technology Conference* (2008) 2563-2570

Manuscripts in Preparation

18. **D. Erdeniz**, A. De Luca, D.N. Seidman, D.C. Dunand, “Effect of Niobium and Tantalum on the Microstructural Evolution and Mechanical Properties of an L1₂-Strengthened Aluminum Alloy,” *to be submitted to Materials Science and Engineering A*
19. N. Lippitz, **D. Erdeniz**, D.C. Dunand, “Mechanical Behavior of 3D-Braided Nickel-Based Superalloys Synthesized via Pack Cementation,” *to be submitted to Scripta Materialia*

20. **D. Erdeniz**, T. Ando, “Investigation of Early-stage Reactions in Nickel-Aluminum Reactive Composites Produced by Ultrasonic Powder Consolidation,” *to be submitted to Intermetallics*
21. **D. Erdeniz**, H.-H. Cho, A.R. Yost, K.W. Sharp, D.C. Dunand, “High Temperature Creep and Oxidation Behavior of Woven Ni-based Superalloys,” *to be submitted to Acta Materialia*
22. A.R. Yost, **D. Erdeniz**, A.E. Paz y Puente, D.C. Dunand, “Wire Size Effect on the Phase and Kirkendall Pore Evolution in Ti-Coated Ni Wires” *to be submitted to Metallurgical and Materials Transactions A*

INVITED PRESENTATIONS

1. **D. Erdeniz**, “Development of Lightweight Structural Metals for High Temperature Applications,” MSE Graduate Seminar, University of Cincinnati, April 14, 2017, Cincinnati, OH
2. **D. Erdeniz**, W. Nasim, J. Malik, B. Mansoor, G. Ayoub, I. Karaman, D. Seidman, D. Dunand, “Effect of Vanadium on Microstructural Evolution and Creep Properties of Dilute Al-Er-Sc-Zr-Si Alloys,” Materials Science and Technology Conference, October 23–27, 2016, Salt Lake City, UT
3. **D. Erdeniz**, “Creating Micro-Architected Ni-Based Superalloys via Gas-Phase Alloying,” Engineering Seminar Series, Koc University, May 13, 2016, Istanbul, Turkey
4. **D. Erdeniz**, “Creating Micro-Architected Ni-Based Superalloys via Gas-Phase Alloying,” Engineering Seminar, Sabanci University, May 11, 2016, Istanbul, Turkey
5. **D. Erdeniz**, “Creating Micro-Architected Ni-Based Superalloys via Gas-Phase Alloying,” Metallurgical Engineering Seminar, Karadeniz Technical University, May 6, 2016, Trabzon, Turkey
6. **D. Erdeniz**, “Creating Micro-Architected Ni-Based Superalloys via Gas-Phase Alloying,” MEMS Graduate Seminar, University of Pittsburgh, March 3, 2016, Pittsburgh, PA
7. K. Hemker, J. Guest, S. Ryan, T. Weihs, L. Zhao, K. Sharp, D. Dunand, **D. Erdeniz**, P. Voorhees, R. Fonda, A. Geltmacher, A. Levinson, H. Kahn, A. Heuer, “Textile Manufacturing of 3D Lattice Materials,” MRS Fall Meeting, November 29–December 4, 2015, Boston, MA
8. A. Paz y Puente, **D. Erdeniz**, J. Fife, D. Dunand, “Phase and Kirkendall Void Evolution Study in Aluminized Ni-Cr Wires via Ex Situ Annealing and In Situ X-ray Tomographic Microscopy Experiments,” TMS Annual Meeting, March 15–19, 2015, Orlando, FL

CONTRIBUTED PRESENTATIONS

1. **D. Erdeniz**, W. Nasim, J. Malik, S. Baik, B. Mansoor, G. Ayoub, I. Karaman, D. Seidman, D. Dunand, “Processing and Characterization of High-Temperature Resistant Aluminum Alloys Microalloyed with Sc, Er and Zr,” TMS Annual Meeting, February 14–18, 2016, Nashville, TN
2. **D. Erdeniz**, K. Sharp, D.C. Dunand, “3D-Woven NiTi Wire Scaffolds for Bone Implants,” Materials Science and Technology Conference, October 4–8, 2015, Columbus, OH
3. **D. Erdeniz**, H. Cho, A. Paz y Puente, K. Sharp, D.C. Dunand, “Processing and High-Temperature Creep of Topologically-Optimized, 3D-Woven, Ni-Based Superalloy Wire Scaffolds,” Materials Science and Technology Conference, October 4–8, 2015, Columbus, OH
4. A. Paz y Puente, **D. Erdeniz**, J.L. Fife, X. Xiao, D.C. Dunand, “Diffusion Study of Aluminized and Titanized Ni Wires via Ex Situ Annealing and In Situ X-ray Tomography Experiments,” Materials Science and Technology Conference, October 4–8, 2015, Columbus, OH

5. L. Zhao, S. Ha, S. Ryan, Y. Zhang, J. Ortega, K. Sharp, A. Geltmacher, R. Fonda, A. Kinsey, **D. Erdeniz**, D. Dunand, K. Hemker, J. Guest, T. Weihs, “Characterization of Fluidic and Thermal Properties in Topology Optimized 3D Lattice Materials,” Materials Science and Technology Conference, October 4–8, 2015, Columbus, OH
6. **D. Erdeniz**, H. Cho, Y. Zhang, L. Zhao, S. Ryan, S. Ha, A. Levinson, D. Rowenhorst, K. Sharp, A. Geltmacher, R. Fonda, J. Guest, T. Weihs, K. Hemker, D. Dunand, “3D Woven Ni-based Superalloy Scaffolds,” 9th International Conference on Porous Metals and Metallic Foams, August 31– September 2, 2015, Barcelona, Spain
7. **D. Erdeniz**, T. Schaedler, H. Cho, Z. Lu, A. Jacobsen, W. Carter, D. Dunand, “Ni-based Superalloy Micro-lattice Structures (poster),” 9th International Conference on Porous Metals and Metallic Foams, August 31– September 2, 2015, Barcelona, Spain
8. **D. Erdeniz**, K. Sharp, D. Dunand, “Transient Liquid Phase Bonded Ni-Based Woven Superalloys,” TMS Annual Meeting, March 15–19, 2015, Orlando, FL
9. **D. Erdeniz**, T. Schaedler, Z. Lu, A. Jacobsen, W. Carter, D. Dunand, “Ni-based Superalloy Micro-lattice Structures,” presented at the TMS Annual Meeting, March 15–19, 2015, Orlando, FL
10. **D. Erdeniz**, K. Sharp, D. Dunand, “Fabrication of 3D Woven and 3D Braided Ni-based Superalloys,” TMS Annual Meeting, February 16–20, 2014, San Diego, CA
11. **D. Erdeniz**, T. Ando, “Al-Ni Energetic Composites Produced from Nano-thickness Flakes by Ultrasonic Powder Consolidation,” TMS Annual Meeting, February 16–20, 2014, San Diego, CA
12. A. Paz y Puente, **D. Erdeniz**, M. Glazer, T. Philippe, J. Fife, P. Voorhees, D. Dunand, “An In-situ X-ray Micro Tomography Study on the Evolution of Aluminide Coatings on Ni-Cr Wires,” TMS Annual Meeting, February 16–20, 2014, San Diego, CA
13. T. Philippe, P. Voorhees, **D. Erdeniz**, D. Dunand, “Phase Formation and Kinetics during Aluminization of Nickel and Nickel-Chromium Wires (poster),” 2nd World Congress on Integrated Computational Materials Engineering, July 7–11, 2013, Salt Lake City, UT
14. **D. Erdeniz**, A. Levinson, D. Rowenhorst, A. Geltmacher, R. Fonda, K. Sharp, D. Dunand, “Vapor Phase Alloying of Ni-based 3D Woven and 3D Braided Structures,” 8th International Conference on Porous Metals and Metallic Foams, June 23–26, 2013, Raleigh, NC
15. L. Zhao, S. Ha, K. Sharp, A. Geltmacher, A. Kinsey, Y. Zhang, **D. Erdeniz**, D. Dunand, K. Hemker, J. Guest, T. Weihs, “Enhanced Permeability of 3D Woven Lattice Structures,” 8th International Conference on Porous Metals and Metallic Foams, June 23–26, 2013, Raleigh, NC
16. Y. Zhang, S. Ha, L. Zhao, **D. Erdeniz**, K. Sharp, A. Geltmacher, D. Dunand, J. Guest, T. Weihs, K. Hemker, “Tailoring Stiffness of 3D Woven Lattice Materials by Architectural Design,” 8th International Conference on Porous Metals and Metallic Foams, June 23–26, 2013, Raleigh, NC
17. L. Zhao, S. Ha, K. Sharp, A. Geltmacher, A. Kinsey, Y. Zhang, **D. Erdeniz**, D. Dunand, K. Hemker, J. Guest, T. Weihs, “Enhanced Permeability of 3D Woven Lattice Material with Experimental Testing and Modeling,” TMS Annual Meeting, March 3–7, 2013, San Antonio, TX
18. S. Gheybi, M. Wood, **D. Erdeniz**, T. Ando, “Fabrication of Various Nanoheaters by Ultrasonic Powder Consolidation,” MRS Fall Meeting, November 25–30, 2012, Boston, MA
19. Z. Gu, Q. Cui, J. Chen, J. Buckley, T. Ando, **D. Erdeniz**, P.Y. Wong, A. Hadjiafxenti, P. Epaminonda, I.E. Gunduz, C.G. Rebholz, C.C. Doumanidis, “Fabrication, Characterization, and Applications of Novel Nanoheater Structures,” International Conference on Metallurgical Coatings and Thin Films, April 23–27, 2012, San Diego, CA

20. C. Rebholz, A. Hadjiafxenti, I.E. Gunduz, P. Epaminonda, **D. Erdeniz**, T. Kyratsi, T. Ando, C.C. Doumanidis, “Exothermic Reaction Characteristics of Ball-Milled and Ultrasonic Consolidated Al-Ni Powder Compacts,” MRS Fall Meeting, November 28–December 2, 2011, Boston, MA
21. **D. Erdeniz**, T. Ando, “Characterization of Al-Ni Composites Produced by Ultrasonic Powder Consolidation,” TMS Annual Meeting, February 27–March 4, 2011, San Diego, CA
22. **D. Erdeniz**, T. Ando, “Characterization of Reactive Composite Materials Produced by Ultrasonic Powder Consolidation (poster),” NSF CMMI Engineering Research and Innovation Conference, January 4–7, 2011, Atlanta, GA
23. J. Chen, J. Pelealuw, Z. Gu, Q. Cui, T. Ando, **D. Erdeniz**, P.Y. Wong, “Industrial Safety of Nanoheaters: Enhanced Fabrication Methods, Ignition Characteristics, and Solid-State Reaction Modeling (poster),” NSF CMMI Engineering Research and Innovation Conference, January 4–7, 2011, Atlanta, GA
24. **D. Erdeniz**, G. Gulsoy, D. Colanto, T. Ando, “Ignition Characteristics of Aluminum-Nickel Heterostructures Produced by Ultrasonic Powder Consolidation,” TMS Annual Meeting, February 15–18, 2010, Seattle, WA
25. **D. Erdeniz**, T. Ando, “Ignition Characteristics of Aluminum-Nickel Heterostructures Produced by Ultrasonic Powder Consolidation Method (poster),” NSF Engineering Research and Innovation Conference, June 22–25, 2009, Honolulu, HI
26. J. Chen, J. Pelealuw, Z. Gu, Q. Cui, T. Ando, **D. Erdeniz**, P.Y. Wong, “Industrial Safety of Nanoheaters: Understanding effects of manufacturing parameters on ignition and heat output (poster),” NSF Engineering Research and Innovation Conference, June 22–25, 2009, Honolulu, HI
27. D. Colanto, **D. Erdeniz**, G. Gulsoy, I.E. Gunduz, T. Ando, P.Y. Wong, C.C. Doumanidis, “Ultrasonic Consolidation of Pure Al and Composite Al-Ni Powder Compacts,” Materials Science and Technology Conference, October 5–9, 2008, Pittsburgh, PA
28. **D. Erdeniz**, E. Balikci, “Precipitate Formation and Evolution in the Superalloy IN738LC,” International Materials Research Conference, June 9–12, 2008, Chongqing, China

TEACHING EXPERIENCE

Guest Lecturer, Northwestern University, Evanston, IL

2016 – present

- MSE 381/Energy Materials: Prepared lecture notes and delivered one lecture in Fall 2016 quarter on energy plants and high temperature materials, particularly superalloys
- MSE 435/High Temperature Materials: Prepared lecture notes and delivered three lectures in the winter quarter of both 2016 and 2017 on Ni-based superalloys, coatings, and sintering theory
- Applied various interactive learning activities such as small group discussions and think-pair-share as part of these lectures to foster critical thinking

Research Mentor, Northwestern University, Evanston, IL

2012 – present

- Mentored eight undergraduate and graduate students, including three conducting senior theses and one master’s thesis
- Trained students on experimental techniques, set achievable research objectives, and monitored their progress while guiding them toward being independent researchers

Teaching Certificate Program, Northwestern University, Evanston, IL

2015 – 2016

- Participated in a year-long sequence of interdisciplinary seminars, special-topics workshops, and peer and faculty mentoring, focused on improving student learning across disciplines
- Designed a High Temperature Materials course with all components (syllabus, lecture notes, lecture plan, evaluations, etc.) over the course of the program while getting constant feedback from peers, program coordinators, and a faculty mentor
- Worked with Prof. David Dunand (primary instructor of High Temperature Materials) to recreate course content, lectures, and notes and conducted three guest lectures

Mentored Discussions in Teaching, Northwestern University, Evanston, IL

Fall 2013

- Participated in a quarter-long program that involves observing an engineering faculty and having discussions regarding teaching practices

Teaching Assistant and Lab Instructor, Bogazici University, Istanbul, Turkey

2006 – 2007

- ME 210-212/Introduction to Materials Science and Engineering: Designed and conducted lab sessions for mechanical engineering sophomores while grading homework assignments, lab reports, and term papers

TEACHING INTERESTS

Introduction to Materials Science and Engineering, Physical Metallurgy, Thermodynamics of Materials, Kinetics of Phase Transformations, Mechanical Behavior (Properties) of Materials, Material Processing, Materials Selection, Additive Manufacturing, High Temperature Materials

MENTORING EXPERIENCE

2016 – present	Ryan Weidinger, Northwestern University
2015 – present	Aaron Yost, Northwestern University
2015	Sarah Plain, Northwestern University (co-mentored with A.E. Paz y Puente)
2014	Nicolas Lippitz, Northwestern University (visiting from TU Braunschweig)
2013 – 2014	Angelina Lu, Northwestern University
2012 – 2013	Sky Park, Northwestern University
2012 – 2013	Edward Lee Pang, Northwestern University
2010 – 2011	Ming Wood, Northeastern University

SYNERGISTIC ACTIVITIES

- **Reviewer** – Materials Science and Engineering A, Surface and Coatings Technology, Journal of Materials Engineering and Performance, Metallurgical and Materials Transactions A, Journal of Materials Processing Technology, Additive Manufacturing, JOM, Metals, Journal of Alloys and Compounds, Current Nanomaterials
- **Visiting User** – Conducted X-ray tomography experiments at the Swiss Light Source and the Advanced Photon Source, 2013 – present
- **Grantsmanship for the Research Professional** – Attended a two-day executive-style workshop teaching and enhancing skills associated with effective grant opportunity identification, preparation, writing, and submission to early career researchers, October 2015
- **Member** – ASM International, TMS, Turkish American Scientists and Scholars Association