Logan Kirsch

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U.S. Citizen

EDUCATION

University of Texas, Austin, TX — August 2021-Present
PhD in Mechanical Engineering
Research Area: Solid Mechanics and Materials Engineering
Dissertation Topic: Effects of Tip Geometry on Nanomechanical AFM Measurements
GPA: 3.9/4.0

Purdue University, West Lafayette, IN — August 2014-May 2018
Bachelor of Science in Aeronautical and Astronautical Engineering
Concentration: Structures and Materials

RESEARCH EXPERIENCE

National Institute of Standards and Technology, Boulder, CO — July 2024-Present
Guest Researcher

- Developed improved techniques for measurements in contact-resonance atomic force microscopy
- Improved polymer material system for simplified research of nanomechanical measurements

Mangolini Laboratory for Applied Surface Science, Austin, TX — August 2021-Present
Graduate Research Assistant

- Performed mechanics and materials research with an emphasis on contact problems
- Developed techniques to improve elastic modulus measurements in atomic force microscopy
- Characterized polymeric, metallic, and ceramic material mechanical and chemical properties at macro-, micro-, and nanoscales

WORK EXPERIENCE

Arconic Aluminum Extrusions, Chandler, AZ — August 2018-June 2021
Location Lead Technical Associate

- Developed patented anneal process to improve material properties of formed aluminum extrusions
- Led projects to qualify new programs, improve quality, and increase manufacturing throughput
- Conducted material tests and interpreted data for the development of aerospace aluminum applications
- Worked directly with customers to identify and develop best material solutions for new programs

TEACHING EXPERIENCE

Materials Engineering Lab, Austin, TX — August 2023-May 2024
Teaching Assistant

- Led students through hands-on materials testing and characterization techniques
- Lectured students on material techniques related to metals, ceramics, polymers, and composites

CONFERENCE PRESENTATIONS

- **L.J. Kirsch**, G.R. Rodin, F. Mangolini, *Effects of Evolving Tip Geometry on Young's Modulus Maps in Atomic Force Microscopy*. SEM Annual Conference, Portland, USA, June 2024
- **L.J. Kirsch**, N. Molina, G.R. Rodin, F. Mangolini, *Effects of Tip Geometry on Elastic Modulus Maps in Atomic Force Microscopy*. STLE Tribology Frontiers, Cleveland, USA, November 2023
- **L.J. Kirsch**, K.R. Rebrov, N. Molina, G.R. Rodin, F. Mangolini, *Utilizing Fracture Mechanics Methods in the Examination of Contact Problems*. SES Annual Conference, College Station, USA, October 2022

AWARDS

- 2024 Gordon Research Conference in Tribology Poster Award
- University of Texas at Austin Engineering Foundation Endowed Graduate Presidential Scholarship
- Alton R. and Doris A. Hagedorn Endowed Graduate Fellowship in Engineering
- University of Texas at Austin Graduate Student Professional Development Award

RELATED SKILLS

- **Atomic Force Microscopy:** Contact Imaging, Non-Contact Imaging, and Nanomechanics
- **Mechanical Materials Testing:** Static, Dynamic, and Corrosion tests
- **Additional Microscopy:** Optical, SEM, EDS, and STEM
- **3D Modeling and Simulation**: SolidWorks, Abaqus, and CATIA
- **Computer Coding**: Matlab, Python, C, and VBA

PATENTS

1. Kirsch, L., Yocum, L., Denzer, D., Bae, D., Kulovits, A., & Cheney, R. (2020) *Methods of Cold Forming Aluminum Lithium Alloys*

GRADUATE COURSEWORK

Solid Mechanics:

Solid Mechanics I Fall 2021

Mathematical description of stress, deformation, and constitutive equations of solid mechanics; boundary value problems of elasticity.

The Finite Element Method Fall 2021

Weighted residual methods; strong and weak forms;boundary conditions; basis functions; error estimates; one-dimensional second- and fourth-order problems; two-dimensional potential and plate problems; dynamic and eigenvalue problems; numerical, computational, and meshing issues.

Solid Mechanics II Spring 2022

Plane, axisymmetric, and three-dimensional crack, contact, and inclusion linear elastic boundary value problems; complex variable methods; equilibrium equations in terms of stress functions; displacement field representations: Papkovitch-Neuber, Boussinesq, Galerkin, Love; Eshelby's equivalent inclusion method.

Theory of Plasticity Spring 2022

Physical basis of plastic deformation; mathematical theory of incremental plasticity; total theories; numerical implementation; rate dependent (viscoplastic) models; plastic anisotropy.

Continuum Mechanics Fall 2022

Foundations of the generally nonlinear theories of continuum mechanics; general treatment of deformation and motion of continua, balance laws and thermodynamics, constitutive models, with particular applications to elastic solids and simple materials.

Fracture Mechanics Spring 2024

Basic principles underlying the mechanics of fracture; determination of stress and strain fields in a cracked body; fracture criterion for crack advance; linear and nonlinear fracture mechanics concepts; separation mechanisms near a crack tip

Materials Engineering:

Introduction to Phase Transformations Spring 2022

General types of phase transformations in solids; classical thermodynamics of phase transformations; diffusional and diffusionless transformations; spinodal decomposition; reaction–limited or diffusion–limited growth and coarsening.

Introduction to Thermodynamics of Materials Fall 2022

Thermodynamic properties; reactions and chemical equilibrium in gasses; solutions, phase equilibria, phase diagrams, reaction equilibria; surfaces and interfaces; point defects in crystals.

Practical Electron Microscopy Fall 2022

Principles, operation, and techniques of transmission electron microscopy; acquiring and interpreting imaging, diffraction, and spectroscopy information; hands-on experience with a transmission electron microscope and a scanning electron microscope.

Mechanical Behavior of Materials Spring 2023

Elastic deformation; viscoelasticity; yielding, plastic flow, plastic instability; strengthening mechanisms; fracture, fatigue, creep; significance of mechanical properties tests; microstructural mechanisms and macroscopic behavior of metals, polymers, ceramics, and composites.

Mathematics:

Partial Differential Equations and Applications Fall 2023

First- and second-order partial differential equations and classification (particularly the wave, diffusion, and potential equations); equation origins in applications and properties of solutions; maximum principles, Green's functions, eigenvalue problems; Fourier expansion methods.