

Alexander Goldman

Materials Engineer | Metallurgist

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Summary

Ph.D. in Industrial Engineering from Iowa State University. A chronic problem solver who is never satisfied until the root cause is understood. Usually the first in the lab group to learn a new technique, then standardizes it and trains others. Communicates across technical and non-technical audiences: technical reports, presentations, training. Hands-on laboratory person; built an entire micro-industrial lab from an empty room. Collaborates with external research groups, defense industry partners, and colleagues on LPBF troubleshooting. Frequently hosts tours of the shared additive laboratory, explaining the processes to visitors of every technical background.

Core Competencies

- Precision Fabrication: FIB/SEM micron-scale optic fabrication for NIF; wire EDM; vacuum induction casting; vacuum arc melting.
- Machining & Subtractive: CNC 3-axis milling (Haas), metal lathe, manual endmilling; specimen sectioning and metallographic preparation.
- AM & Fabrication: LPBF process parameters and microstructure development; wire EDM; CNC machining; vacuum arc melting and vacuum induction casting; heat treating; forging; electropolishing; sputter coating.
- Additive Manufacturing: LPBF process-microstructure relationships; SLS; FDM; DFAM; DED (coursework).
- Toolpath & Build Preparation: Commercial slicer workflows for infill strategy (adaptive cubic, honeycomb, 3D honeycomb), surface patterning, and path planning; how toolpath choices drive density, anisotropy, and surface finish.
- Data Analysis & DOE: Six Sigma DMAIC; DOE design and statistical analysis; Python scripting for data processing; Minitab (coursework); structured experiment reporting and presentation to technical audiences.
- Post-Build Analysis: Tensile, compression, and microhardness testing; surface roughness characterization; metallographic preparation and analysis; SEM/EDS/EBSD/XRD for microstructural evaluation.
- Failure Analysis & Standards: Root cause analysis via microstructural evaluation; Six Sigma DMAIC methodology; process specification development; ASTM mechanical testing.
- Lightweight Structures: Alloy design (Mg, Al) for structural weight reduction; corrosion analysis in service-relevant conditions.
- Documentation & Collaboration: Technical report and SOP authoring; experimental data tracking and organization; cross-functional communication with engineers and stakeholders.

Skills

Laser Powder Bed Fusion (LPBF), Alloy Design & Processing, Heat Treatment Design, DOE Design & Statistical Analysis, Materials & Process Specs., Characterization: SEM, EDS, EBSD, FIB, TEM, XRD, Mechanical Testing: Tensile, Compression, Microhardness, Corrosion & Failure Analysis, Post-Build Analysis & Metrology, CNC Machining (Haas), Lathe, Six Sigma Green Belt (IISE), Python (data analysis, scripting), Python, LAMMPS (MD), DFT, SOLIDWORKS & Fusion 360, Experimental Design & Execution, Metal Alloy Design & Evaluation, DFAM & Design for Manufacture, DFT (Quantum ESPRESSO), LAMMPS (MD), XRF & Optical Microscopy, Statistical Process Control (SPC), Slicer Toolpath & Infill Strategy, Minitab (coursework), Materials Selection (CES EduPack), PostgreSQL, Linux,

Experience

Research Assistant, Iowa State University

Ames, IA | 08/2023 to 08/2026

- Designed and executed heat treatments to investigate intermetallic precipitate morphology and mechanical response in novel Mg alloys.
- Designed and executed structured experiments (DOE methodology) to investigate process-microstructure-property relationships in novel Mg alloy systems; analyzed results using statistical tools and Python.
- Conducted end-to-end material qualification study: alloy design, vacuum induction casting, extrusion, heat treatment, mechanical testing, and microstructural characterization.
- Built micro-industrial lab: vacuum induction furnace, wire EDM, 3-axis CNC milling, metal lathe, electropolishing, and electron microscopy.
- Prepared master alloys using a vacuum arc melter, operating arc welding techniques under controlled atmosphere to produce homogeneous alloy.
- Investigated surface corrosion on Mg castings; reported findings to a defense industry partner.
- Systematically studied novel Mg alloys from alloy design through mechanical and microstructural characterization.
- Filed a patent application for a novel Mg alloy family with Iowa State University Technology Transfer.
- Performed microstructural characterization and texture analysis on LPBF-produced Ti-5553 samples; delivered process improvement recommendations to colleagues based on the results.
- Troubleshoot colleagues' experimental LPBF platforms using process-microstructure understanding to isolate build issues.
- Troubleshoot colleagues' LPBF and DED machines in a shared metal additive laboratory, isolating build faults from process-microstructure evidence.
- Worked daily in a shared metal additive laboratory (Slater Laboratory) spanning four processes: a commercial hybrid DED system on a HAAS 5-axis platform, an experimental LPBF system built for alloy development, an experimental multi-wire WAAM system on a Kawasaki robot arm, and a commercial ultrasonic metal printer.
- Ran experiments on a commercial ultrasonic metal additive machine, a modified HAAS 3-axis platform that prints and machines from metal sheet and foil spools, giving hands-on experience with a solid-state process that consolidates metal without melting it.
- Applied DFT-informed phase prediction (Quantum ESPRESSO) to guide compositional design of novel Mg alloy systems.
- Administered laboratory NAS and HPC infrastructure for simulation rendering and research data archival.
- Completed graduate coursework in LPBF: process parameters, microstructure development, and thermal gradient effects.
- Completed graduate coursework in DOE and FEA simulation of LPBF processes: process parameters, thermal gradients, and microstructure development.
- Characterized intermetallic precipitates in the Mg-Al-Bi system by transmission electron microscopy, using bright-field TEM and STEM/EDS to resolve phase composition and distribution in support of the invention disclosure.
- Performed post-processing characterization including tensile testing, microhardness, surface analysis, SEM/EDS, and EBSD; recorded all data in structured summary reports presented to research group.
- Developed and implemented standardized laboratory procedures and process specifications to ensure reproducibility across operators.

Research Intern, Polish Academy of Sciences, Krakow
Krakow, Poland | 07/2023 to 08/2023

- Computational modeling of shape memory alloys; EBSD and texture analysis on Mg alloys; communicated findings in written reports to international collaborators.
- Ran molecular dynamics simulations (LAMMPS) of atomic movements and geometries in shape memory alloys.

Research Assistant, University of Nevada, Reno
Reno, NV | 08/2021 to 07/2023

- Led electron microscopy laboratory (SEM, FIB, TEM); trained users on equipment operation and specimen preparation; authored SOPs for all instruments.
- Fabricated precision FIB-milled slits for beamline optics used in warm dense matter experiments at the National Ignition Facility (NIF); performed in-process metrology to verify dimensional tolerances.
- Designed, cast, forged, and mechanically tested lightweight Al and Mg alloys; designed heat treatments for precipitate morphology studies.
- Operated endmill and lathe for specimen and prototype fabrication.
- Performed materials analysis for university and external research groups.
- Designed heat treatments to investigate precipitate morphology and phase stability in lightweight alloys.

Research Intern, National Renewable Energy Laboratory
Golden, CO | 06/2021 to 08/2021

- Developed a liquid crystals SQL database for hydrogen storage research; scripted data pipelines in Python for ingestion and retrieval.
- Developed and maintained a liquid crystals materials database in PostgreSQL for hydrogen storage research.

Makerspace Consultant, University of Nevada, Reno
Reno, NV | 08/2019 to 06/2021

- Delivered training in laser cutting, FDM/SLS 3D printing, 3D scanning, vacuum forming, and metal casting; authored SOPs for all equipment.
- Operated, serviced, and taught users on a commercial nylon powder-bed (LPBF/SLS) printer over two years, handling machine maintenance personally.

Education

Ph.D., Industrial Engineering, Iowa State University
GPA 3.5 | 2023 to 2026

B.S., Materials Science and Engineering, Univ. of Nevada, Reno
GPA 3.6; Minors: Mathematics; Mfg. Quality | 2017 to 2021

Certifications

- Fundamentals of Deep Learning, NVIDIA, 2025
- Six Sigma Green Belt, IISE, 2024
- SOLIDWORKS CSWA Certified, Dassault Systemes, 2020

Awards

- 1st Place: Graduate Poster, 2025. IMSE Research Symposium 2025
- Eagle Scout, 2017. Boy Scouts of America

Publications

- Goldman, A., Xu, Z.G., Li, B., Liao, Y.L., Jordan, A. (2025). Effect of alloying elements on the mechanical behavior of extruded Mg-Al-Bi alloys. *Mater. Sci. Eng. A*.
- Schoelmerich, M.O., et al. (incl. Goldman, A.) (2023). Fresnel diffractive radiography at NIF with 1\, resolution. *Rev. Sci. Instrum.* 94, 013104.
- Li, B., Goldman, A., Xu, J. (2023). Reactive diffusion of Li in Si anode materials. *Materialia*.