

Exponent®
Engineering & Scientific Consulting

Alyssa Stubbers, Ph.D.

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Professional Profile

Dr. Stubbers specializes in investigation of complex relationships between processing, microstructure, and properties and their effect on material performance, safety, and reliability. She applies her expertise in high-temperature metallurgy, advanced materials characterization, and mechanics of materials to determine root causes of material degradation, damage, and failure across service environments involving elevated temperatures, complex thermal histories, mechanical loading, and microstructural transformation.

Her technical expertise includes microstructure development and deformation in metals and ceramics. She has extensive hands-on experience with Gleeble thermal mechanical simulation, scanning electron microscopy (SEM) analysis with energy dispersive spectroscopy (EDS) and electron backscatter diffraction (EBSD). Additionally, she has used focused ion beams (FIB/PFIB) for sample preparation and analyzed material structures with transmission electron microscopy (TEM). She has experience designing and optimizing parts for additive manufacturing platforms, including laser powder bed fusion and electron beam systems. Her work frequently involves evaluating microstructural evolution during processing and service, identifying features associated with embrittlement, cracking, and performance limitations, and correlating microstructural observations with mechanical behavior.

Drawing on experience spanning academic research, national laboratories, and applied engineering environments, Dr. Stubbers provides technical analysis in several industries, including energy, aerospace, and advanced manufacturing. Her work supports efforts to improve materials development, process optimization, and lifetime material performance.

In her graduate research, Dr. Stubbers investigated hot cracking in HSLA steels during continuous casting, identifying contributing metallurgical and processing factors affecting crack formation and propagation. More recently, she has contributed to the evaluation of catalyst materials for satellite propulsion systems and the characterization of ultra-high-temperature ceramics for aerospace and defense applications. She also completed research internships at Los Alamos National Laboratory and NASA Glenn Research Center, where she supported materials characterization and performance evaluations of NiTi shape memory alloys and U–Nb alloys.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, University of Kentucky, 2023

B.S., Materials Science and Engineering, Purdue University, 2019

Prior Experience

Engineering Researcher II, Alabama Materials Institute, 2023–2026

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Professional Affiliations

The Minerals, Metals, & Materials Society (TMS)

Association for Iron & Steel Technology (AIST)

Publications

Stubbers A, Solano Castrejon E, Swartley B, Durkee S, Schwind E, Ramirez Acosta A, Weinberger CR, Garcia Vazquez MS, Thompson GB. Machine learning assisted serial sectioning to enable rapid 3D crack network reconstruction. Materialia 2026; 45:102661.

Hossain S, Brumblay HK, Dupre D, Stubbers A, Tand X, Thompson GB, Graeve OA, Weinberger CR. Understanding microstructure-controlled brittle fracture and toughening through a probabilistic framework. Int. J. Mech. Sci 2026; 311:111224.

Solano Castrejon E, Ramirez Acosta AA, Durkee S, Stubbers A, Thompson GB, Weinberger CR, Graeve OA, Garcia Vazquez MS. CNN-based and optical flow-based image interpolation for TaC ceramics. Proceedings Volume 13604, Optics and Photonics for Information Processing XIX 2025.

Espinosa-Cruz EJ, Ramirez-Acosta AA, Stubbers A, Thompson GB, Weinberger CR, Graeve OA, Garcia Vazquez MS. Comparison of deep conditional generative models for scanning electron microscopy image reconstruction. Proceedings Volume 13604, Optics and Photonics for Information Processing XIX 2025.

Watkins B, Huang Y, Stubbers A, Thompson GB, Weinberger CR. Plasticity-fracture competition and anomalous hardness in the hard metals. Acta Mater 2025; 298:121350.

Blacksher CH, Stubbers A, Weinberger CR, Thompson GB. Influence of transition metal type and process conditions on the hardness of carbide thin films. J. Eur. Ceram. Soc. 2025; 45:117602.

Watkins B, Huang Y, Stubbers A, Thompson GB, Weinberger CR. Plasticity-fracture competition and anomalous hardness in the hard metals. Acta Mater 2025; 298:121350.

Stubbers A, Zhu N, Cramer J, Eden T, Narcarelli A, Brewer L, Balk TJ. Quantification of nanoscale precipitation in AA7050 using X-ray scattering, electron microscopy and automated particle counting techniques. Mater. Charact. 2024; 218(1):114457.

Stubbers A, Balk TJ. Heated-stage small-angle x-ray scattering for quantification of precipitate fields and their evolution during process simulation of AA7050. Met. Mater. Int. 2024; 31:1–15.

Stubbers A, Balk TJ. Quantitative SAXS analysis of precipitate characteristics limiting hot ductility in HSLA steels containing V, Nb & NbTi. ISIJ Int. 2023; 63(6):1044–1053.

Presentations

Stubbers A, Hossain S, Weinberger CR, Graeve OA, Thompson GB. Small tests that make a big difference: correction of the plastic size effect during micromechanical testing. Oral presentation, MS&T 2025.

Stubbers A, Swartley B, Durkee S, Schwind E, Solano E, Ramirez A, Weinberger CR, Graeve OA, Garcia M, Thompson GB. Influence of 3D crack networks for high toughness responses in tantalum carbides. Oral presentation, 3DMS 2025.

Stubbers A, Thompson GB. Fabrication of single grain microcantilevers to quantify directional fracture toughness of Ta2C. Oral presentation, ICAAC 2025.

Project Experience

Advanced Manufacturing

- Designed physical simulation experiments to replicate continuous casting process in Gleeble 3500 system.
- Identified key microstructure features leading to high temperature low ductility performance in continuously cast HSLA steels.
- Established partnerships to develop methodology for single crystal production of NiTi shape memory alloys.
- Performed experimental testing to determine formability of U-Nb between 300 - 800 °C.

New Material Development

- Identified alternate catalyst materials and processing methods for satellite propulsion which included replacing Iridium substrates with more cost-effective alternatives while maintaining equivalent thrust output.
- Designed new catalyst bed geometries, including improved surface area and fluid flow and incorporation of resistive heating elements.

High Toughness Ceramics

- Performed experiments to evaluate the influence of carbon content on the toughness of tantalum carbide materials which enabled differentiation of contributions to toughness from chemistry and microstructure.
- Developed procedure for machining and testing single grain directionally oriented microcantilevers in tantalum and hafnium carbides.
- Developed procedure for high-speed SEM serial sectioning using machine learning tools.