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Engineering & Scientific Consulting

Alex Preston, Ph.D.

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Professional Profile

Dr. Preston specializes in failure analysis and prevention of engineering materials, components and systems. His primary expertise includes powder metallurgy, metallurgy, microstructure evolution, additive manufacturing, and finite element analysis.

Additionally, Dr. Preston has a substantial background in materials characterization techniques inclusive of metallography, optical microscopy, scanning electron microscopy (SEM), image processing, and mechanical testing at both the macroscopic and microscopic level.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, Colorado State University, 2022

B.S., Materials Engineering, Iowa State University, 2017

Prior Experience

Prior to joining Exponent, Dr. Preston earned his Ph.D. at Colorado State University, where he studied the effects of spark plasma sintering, additive manufacturing, and pressureless sintering processes on the microstructure of pure titanium, titanium alloys, stainless steels, and ultra-high-temperature ceramics. His dissertation research focused on controlling electrical and thermal gradients within spark plasma sintering to create functionally graded porous materials in 316L stainless steel and pure titanium. This work included extensive imaging, microstructure characterization, and mechanical testing, which was used to create and validate a finite element model able to accurately predict local porous structure based on thermal history.

Publications

Preston AD, Ma K. Insight into the effects of pore size and distribution on mechanical properties of austenite stainless steels. Journal of Materials Science 56 (30), 17278-17295, 2021.

Preston AD, Ma K. Effect of powder morphology on the microstructure and mechanical property gradients in stainless steels induced by thermal gradients in spark plasma sintering. MRS Advances 6 (19), 482-288, 2021.

Tang X, Kuehster AE, DeBoer BA, Preston AD, Ma K. Enhanced thermionic emission of mayenite electride composites in an AR glow discharge plasma. Ceramics International 47 (12), 16614-16631, 2021.

Evans RC, Austin R, Miller RC, Preston AD, Nilsson ZN, Ma K, Sambur JB. Surface-Facet-Dependent Electrochromic Properties of WO3 Nanorod Thin Films: Implications for Smart Windows. ACS Applied Nano Materials 4 (4), 3750-3759, 2021.

Cramer CL, Preston AD, Ma K, Nandwana P. In-Situ metal binder-phase formation to make WC-FeNi Cermets with spark plasma sintering from WC, Fe, Ni, and carbon powders. International Journal of Refractory Metals and Hard Materials 88, 105204, 2020.

Cramer CL, Preston AD, Elliott AM, Lowden RA. Highly dense, inexpensive composites via melt infiltration of Ni into WC/Fe preforms. International Journal of Refractory Metals and Hard Materials 82, 255-258, 2019.

Presentations

Alexander Preston, Kaka Ma. Microstructure and Mechanical Property Gradients induced by Thermal Gradients in Spark Plasma Sintering. Materials Research Society, Boston, MA, 2021.

Alexander Preston, Kaka Ma. Heterogenous Pore Architecture Achieved by Spark Plasma Sintering. The Minerals, Metals & Materials Society, San Diego, CA, 2020.

Alexander Preston, Yuchen Lin, Kaka Ma. Titanium Alloys with Radially Distributed Porosity and Structural Hierarchy. Materials Science & Technology, Portland, OR, 2019.

Alexander Preston, Kaka Ma. Nanoporous Stainless Steel with Structural Hierarchy. Materials Science & Technology, Columbus, OH, 2018.