



## BACKGROUND

Dr. Sage is a materials scientist specializing in welding related failures. He has extensive experience with weld metallurgy, welding processes, weld degradation, cracking mechanisms, defect formation in metallic materials, and alloy design. He also investigates manufacturing and material processing for defects, especially in materials with non-equilibrium microstructures like those seen in additively manufactured components.

Dr. Sage conducts site inspections and performs laboratory analysis including metallography, materials testing, microscopy, and mechanical testing.

Dr. Sage holds an MS and PhD in Welding Engineering from the Ohio State University, as well as two engineering BS degrees from the University of Florida. In the pursuit of his degrees, he developed and proposed a novel mechanism for liquid metal embrittlement of austenitic steels, a cracking phenomena currently at issue during the processing of third generation advanced high strength steels.

## AREAS OF SPECIALTY

- Fracture Mechanics and Failure Analysis
- Metallurgy
- Metallography
- Microstructural Analysis
- Heat Treatment Operations
- Deformation Mechanisms in Metals
- Weldability Testing
- Static and Dynamic Thermomechanical Testing
- Material Characterization and Analysis
- Alloy Development
- Fracture and Fatigue of Metals
- Oxygen Safety
- Laser Safety
- Hydrogen Safety
- Forensic Analysis
  - Degradation and Cracking Phenomena in Welds
  - Weld and Fastener Failures
  - Fracture Surface Analysis
  - Metal Corrosion
  - Advanced Microstructural Characterization of Metallic Materials
- Codes and Standards
- Power Tools
- Laboratory Analysis of Materials
- Materials Science
- Laboratory Safety
- Cryogenic Safety

## EDUCATION & TRAINING

- Bachelor of Science in Biological Systems Engineering, University of Florida
- Bachelor of Science in Materials Science Engineering, University of Florida
- Master of Science in Materials Science and Engineering, The Ohio State University
- Doctor of Philosophy in Welding Engineering, The Ohio State University
  - Thesis: A Mechanistic Exploration of Liquid Metal Embrittlement in Austenitic Stainless Steels

## PROFESSIONAL EXPERIENCE

### June 2024 – Present | ARCCA, LLC | Senior Materials Scientist

- Investigation and analysis of failures in materials and weldments. Laboratory analysis of metallurgical failures. Failure analysis of mechanical systems and devices.
- Inspection of accident scenes and failed components, including collection of material samples for analysis, photographing the scene, and reviewing case documents

### 2023 -- Present | McSwain Engineering, LLC | Metallurgist

- Failure analysis and engineering investigation. Evaluation of properties, processing and manufacturing of aerospace, automotive and consumer products and materials. Oversight of laboratory operations, metallurgical investigations, and materials testing.

### 2017 -- 2022 | The Ohio State University, Department of Welding Engineering | Research and Teaching Assistant

- Complete research and thesis surrounding liquid metal embrittlement of stainless steels by molten zinc and copper. Develop testing procedures and design of experiments for metallic samples, then analyzed the resulting data and communicated results. Researched, designed, and tested novel alloys for optimized weldability and processing. Trained new students and taught classes in the areas of weldability and brazing.

### 2014 -- 2016 | University of Florida, Department of Materials Science and Engineering | Undergraduate Researcher

- Researcher in the high temperature alloys lab. Sectioned and prepared metallographic samples for microstructural, fracture, and failure analysis. Used fractographic evidence from optical and scanning electron microscopy as well as information from advanced material characterization techniques to perform failure analysis.

## PROFESSIONAL MEMERSHIPS

- American Welding Society (AWS)

## SELECTED PUBLICATIONS

**D. Sage** and C. Fink. "Understanding Temperature and Dwell Time Dependence of Liquid Metal Embrittlement in Austenitic Stainless Steel by Liquid Zinc and Copper." *Materialia*, July 2022, 101502. <https://doi.org/10.1016/j.mtla.2022.101502>.

Ying Lu, **Dean D. Sage**, Carolin Fink & Wei Zhang (2020) Dissimilar metal joining of aluminum to zinc-coated steel by ultrasonic plus resistance spot welding – microstructure and mechanical properties, *Science and Technology of Welding and Joining*, 25:3, 218-227, DOI: 10.1080/13621718.2019.1667051