

FORCON INTERNATIONAL

GERHARD E. FUCHS, PH.D.

SUMMARY

Dr. Fuchs is an established Scientist with over 50 years' experience in the Materials and Mechanical Fields specializing in aerospace, automotive racing, structural and bio-medical components, and aircraft investigations. Over the years Dr. Fuchs has become well versed in the research and applications of the microstructure and properties of high temperature and high-performance materials, including superalloys, intermetallics and composites. Dr. Fuchs throughout his years as an academic professor has taught a host of programs related to the physical and mechanical metallurgy of structural metals, joining of structural material, phase stability, environmental resistance, failure analysis and computational materials science.

EDUCATION

Ph.D. in Materials Engineering with a minor in Mechanical Engineering, Rensselaer Polytechnic Institute; 1986

Bachelor of Science in Unified Engineering, University of California; 1982

PROFESSIONAL ASSOCIATIONS

ASM International
The Materials, Metals and Minerals Society (TMS)
American Society of Mechanical Engineers (ASME)

CONTINUING EDUCATION

Additional courses and certifications completed in the following:

- ERAU, Aviation Accident Investigation and Management Course, 2023.

CAREER HISTORY

FORCON International – Materials Scientist

Conducting forensic investigations and expert witness services as it relates to his fields of expertise.

Consultant, August 2000 - Present

Performed failure analysis on aerospace, automotive racing, structural and bio-medical components, including aircraft crash investigations. Provided guidance for materials and process selection, including AM processing, for aerospace and automotive racing applications. Assisted in the development of new alloys and processes, resulting in 2 patents for novel alloy compositions.

Advisory Engineer, Lockheed Martin-KAPL, 1997-1998

Principal Engineer, Martin Marietta-KAPL, 1992-1997

Engineer, General Electric-KAPL, 1988-1992

Developed and evaluated advanced structural materials for conventional PWR and advanced HTMR/LMR nuclear reactor applications. Assisted with failure analysis of PWR components. Primary research areas included microstructure-property-processing relationships in advanced intermetallic and Ni-base alloys. Guided development and scale-up efforts of advanced concepts and taught internal courses on physical metallurgy, heat treatment and powder metallurgy.

Aerospace Corporation – Member of Technical Staff, 1986-1988

Examined the mechanical and physical metallurgy of intermetallic matrix composites and low thermal expansion alloys. Provided guidance for alloy and process selection and performed failure analysis of engineering materials used in space systems and launch vehicles.

ACADEMICS

Assistant Professor, 1998 – 2004

Associate Professor, 2004 – 2023

Materials Science & Engineering Department, University of Florida, Gainesville, Florida.

Primary research and teaching interests include inter-relationship of processing, microstructure and properties of high temperature and high-performance materials, including superalloys, intermetallics and composites. Additional topics include physical and mechanical metallurgy of structural metals, joining of structural material, phase stability, environmental resistance, failure analysis and computational materials science. Also taught superalloys short courses (with D.H. Boone) and was faculty advisor for University of Florida Materials Advantage Student Chapter.

Adjunct Assistant Professor, 1997-1998

Rensselaer Polytechnic Institute, Troy New York

Taught graduate level course, and two and four-day short courses on High Temperature Alloys.

Adjunct Assistant Professor, 1992-1998

Union College, Schenectady, New York

Developed and taught courses on Physical Metallurgy and Process Metallurgy and Alloy Selection.

PATENTS

“Nickel-Base Alloy for Gas Turbine Components”, US 11,339,458 B2, May 24, 2022, with J.P. Strohl.

“Nickel-Base Alloy For Gas Turbine Applications”, US 9,322,082 B2, April 26, 2016, with C. Biondo, J.P. Strohl, J.W. Samuelson, S.T. Wlodek, R.T. Wlodek.

PRESENTATIONS (Highlights)

Conferences/Symposiums

- “Fracture and Failure Analysis of High Temperature Materials”, ASM/TMS Fall Meeting, Pittsburgh, PA, to be held September 25-28, 2005.
- “Future of MSE Education”, ECI Conference, Kona Hawaii, April 5-8, 2004 (Co-organized with R. Abbaschian and M. McLean)
- “High Temperature Alloys: Processing for Properties”, TMS Annual Meeting, San Diego, California, March 2003, (Co-organized with J. Wahl).
- “Advanced Materials and Processes for Gas Turbines”, UEF Conference, Copper Mountain, Colorado, September 2002, (Co-organized with A. James, T. Gabb, M. McLean and H. Harada).

Courses Developed/Taught

- EMA 3010 – Intro to Materials – Undergraduate level course to introduce materials science and engineering to all College of Engineering students.
- EMA 3123 – Metallurgical Engineering – Undergraduate level course to introduce physical metallurgy principles, including introduction of CALPHAD in discussion of phase diagrams.
- EMA 4020L – Metallurgical Lab – Created hands-on undergraduate lab to support process metallurgy course.
- EMA 4120 – Phys Met I – Undergraduate level course on the physical metallurgy of engineering alloys – Part I.
- EMA 4224 – Phys Met II – Undergraduate level course on physical metallurgy of engineering alloys – Part II.
- EMA 4324 – Materials Stability – Undergraduate level course on environmental resistance and corrosion of engineering materials.
- EMA 4623 – Process Metallurgy – Undergraduate level course on processing and selection of engineering alloys.

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- EMA 4714 – Materials Selection and Failure Analysis – Undergraduate level course on philosophy and practice of selection of engineering materials and case studies in product liability and failure analysis.
- EMA 6106 – Advanced Phase Diagrams – Graduate level course on fundamentals of phase diagrams and incorporated the use of computer software to predict phase stability.
- EMA 6107 – High Temperature Alloys – Newly developed graduate level course on the metallurgy of superalloys and other high temperature materials.
- EMA 6625 – Advanced Metals Processing – Graduate level course on processing of structural materials.

Short Courses/Programs Taught

- “Superalloys for Severe Duty Applications”, Given once yearly at UF and around the world, with D. Boone and W. Miglietti, 2005 to present.
- “High Temperature Alloys – Short Course”, DNV, Oslo, Norway, August 1999 (with N.S. Stoloff).

PUBLICATIONS

Highlight of Recent Papers Published (within the last 10 years)

- “Thermodynamic Simulation and Experimental Validation of Phase Stability in Ni-based Superalloys”, Superalloys 2020, TMS-Warrendale, PA, (2021), with K. Ventura, D. Beaudry, A. Aviles, A. Kapustina, P. Draa, K. Patel and R. Snider).
- “Elevated Temperature, High Cycle Fatigue Behavior of Carbon-containing Single Crystal Ni-Based Superalloys” MSE A, 760, (2019), p. 287-295. (with K.A. Al-Jarba).
- “TEM Observation of Deformation under Nanoindentation in Single Crystal Ni-based Superalloys” Microsc. Microana., 24, (2018), p. 2178-2179. (with A.S. Khalil, J. Turner, B. Oxdol, C. Song, S. Vachhani and A.M. Minor).
- “Investigation of Oxide Bifilms in Investment Cast Superalloy IN100: Part 2. Characterization”, Met Trans A, March 2016 (with M.A. Kaplan).
- “Investigation of Oxide Bifilms in Investment Cast Superalloy IN100: Part 1. Mechanical Properties”, Met Trans A, March 2016 (with M.A. Kaplan).
- “The Effect of Secondary Gamma-prime on the Primary Creep Behavior of Single Crystal Nickel-Base Superalloys”, Met. Trans A., in press (with B.C. Wilson).
- “Project AZORIAN – Cold War Thriller Brings Classroom Theory to Life”, JOM, Vol. 65, (2013), p. 919-924.

AWARDS AND ACHIEVEMENTS

- UF-MSE Triple Point Award – Excellence, Inspiration and Dedication to students (2007).
- UF-COE – Exemplary Graduate Advisor/Mentor in National AGEP Doctoral Program (2004).
- KAPL Teaming Award – For assisting in resolution of production problems and in the processing of naval nuclear fuel elements (1997).
- TMS Young Leaders Committee – For outstanding young members of TMS to foster increased professional society interaction (1996).
- Alfred H. Geisler Award – From the Eastern New York Chapter of ASM for significant achievement in materials engineering (1993).
- Materials, Manufacturing, Quality Engineering Award – From GE Power Generation for development of a P/M steam generator alloy (1993).
- KAPL Outstanding Patent Disclosure Award – For the development of a novel P/M steam generator alloy (1992).