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DALE E. ALEXANDER, Ph.D., P.E.
PRINCIPAL
DIRECTOR OF MATERIALS

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As Director of the Materials practice, Dr. Alexander oversees materials and analysis personnel and related work across multiple offices of ESI.

Prior to joining ESI, in 2001, he worked for 10 years as a research scientist in the Materials Science Division of Argonne National Laboratory. While there his work focused on understanding a variety of radiation effects in metals and alloys including microstructural changes, phase transformations and embrittlement of nuclear reactor pressure vessels via electron microscopic and synchrotron radiation techniques.

Since joining ESI, Dr. Alexander has been active in investigations involving materials issues pertinent to a variety of industries including aviation, automotive, and manufacturing and consumer products. He brings a comprehensive approach to failure analysis and by leveraging the diverse resources of ESI, seeks clear solutions to complex problems offered by clients.

Dr. Alexander is active in many technical and professional societies and has published over 35 articles in refereed journals and conference proceedings**.**

Areas of Specialization

Failure Analysis
Aviation
Consumer Products
Automotive
Materials technology and characterization
Medical Devices
Nuclear materials

Education

Ph.D., Nuclear Engineering, University of Michigan, 1990
M.S., Nuclear Engineering, University of Michigan, 1986
B.S., Nuclear Engineering (Magna Cum Laude), University of Michigan, 1984

Licensed Professional Engineer (P.E.)

State of Illinois ..... License No. 062-056175

June 2017

Professional Affiliations/Honors

ASM International

Editorial Board Member, Journal of Failure Analysis and Prevention (ended April, 2016)
Member and Past Chairman, Failure Analysis Committee 2005
ASM MVP Recognition, 2005
Co-Chair, Aerospace Session in the Failure Analysis Symposium at MS&T 2015
Co-Chair, Tools and Techniques Session in the Failure Analysis Symposium at MS&T 2014
Co-Chair, Nuclear Session in the Failure Analysis Symposium at MS&T 2009
Co-Chair, Charles R. Morin Memorial Session in the Failure Analysis Symposium at MS&T 2009
Co-Chair, Aircraft Engine Component Degradation/Failure Phenomena Session in the Failure Analysis Symposium at MS&T 2006
Co-Chair, Failure Analysis Symposium at MS&T 2005
Co-Chair, Litigation Session in the Failure Analysis Symposium at 2004 ASM Materials Week

Failure Analysis Society, an affiliate society of ASM International

Founding Member, 2016
Member, International Relations Committee, 2016-present
Co-Chair, Non-metallics Session in the Failure Analysis Symposium at MS&T 2016

Mensa

Member since 2003

American Nuclear Society

Member
Graduate Student of the Year, 1986, Materials Science and Technology Division

The Minerals, Metals, and Materials Society

Member

Department of Energy

Nuclear Engineering, Health Physics and Radioactive Waste Management Fellow, 1984-1988

Nuclear Energy Professional Organization (NEPO)

Scholarship recipient, 1983

Tau Beta Pi, Engineering Honor Society

Member

Alpha Nu Sigma, Nuclear Engineering Honor Society

Member, 1983-1984

Positions Held

Engineering Systems Inc., Aurora, Illinois

Principal, 2010 – Present
Director, Materials Practice, 2016 – Present
Director, Materials and Mechanics Practice, 2009 – 2015
Director, Materials and Applied Sciences, 2007 – 2009
Manager, Materials Engineering, 2004 – 2007
Senior Consultant, 2001 – 2009

Argonne National Laboratory, Materials Science Division, Argonne, Illinois

Materials Scientist, 1995 – 2001
Assistant Materials Scientist, 1991 – 1995
Post-Doctoral Researcher, 1990 – 1991

Continued Education

Intensive Course on Electrical Contacts and Connector Design for Electronics and Microelectronics Applications
Timron Scientific Consulting, Inc., 2016

Helicopter Accident Investigation
USC Viterbi School of Engineering, 2015

Fundamentals of Glass Science and Technology
American Ceramic Society, 2013

Rolls Royce M250 Series IV Maintenance Training, 2013

Lubrication Fundamentals, 2013
Decatur Professional Development, LLC

Lycoming Engine Service School, 2009

Automotive Accident Investigation I & II
Northwestern University, Center for Public Safety, 2001

Principles of Failure Analysis
ASM Materials Engineering Institute, 2001

Publications/Presentations

“New Techniques in Aircraft Accident Investigation”, **D.E. Alexander**, presented at the General Aviation Air Safety Investigators 2014 Advanced Technical Workshop, Wichita, KS, September 17, 2014 (**Invited**)

“Failure Investigation of an Aircraft Crankshaft Gear Connection”, M.E. Stevenson, D.G. Klepacki, J.L. McDougall and **D.E. Alexander**, Journal of Failure Analysis and Prevention, 12(6), pp.617-623 (2012)

"Radiography in Failure Analysis: X-ray vs. Neutron" D. M. Norfleet, **D.E. Alexander**, C. Cherry and J. Gauthier, presented at the Failure Analysis Symposium, Materials Science and Technology 2008, Pittsburgh, PA, October 8, 2008

"Laser Based Dimensional Characterization in an Automotive Component Failure Analysis Investigation," **D.E. Alexander**, C. R. Morin, J.T. Eaganhouse, J. Mass, T. Hays, presented at the Failure Analysis Symposium, Materials Science and Technology 2007, Detroit, MI, September 17, 2007

"A Fiberglass Reinforced Plastic Case Study – A Focus on the Importance of Joint Testing Protocols in Current Forensic Practice," C. R. Morin, **D.E. Alexander**, M. P. Van Bree, presented at the Failure Analysis Symposium, 2004 Materials Solutions Conference, ASM International, Columbus, OH, October 19, 2004

“Silicone Replication as a Non-Destructive Failure Analysis Tool,” **D.E. Alexander**, E.V. Dargelis, and C.R. Morin, presented at the 2003 ASM International Materials Solutions Conference, Pittsburgh, PA, October 13, 2003.

“Hardening and Precipitate Character in Proton Irradiated Model Pressure Vessel Steel Alloys,” Q. Yu, G.S. Was, **D.E. Alexander**, and R. Odette, in the proceedings of the 10th International Conference on Environmental Degradation of Materials in Nuclear Power Systems – Water Reactors, (NACE, Houston, TX, 2002).

“Hardening and Microstructure of Model Reactor Pressure Vessel Steel Alloys Using Proton Irradiation,” Q. Yu, G.S. Was, L.M. Wang, R. Odette, and **D.E. Alexander**, in the proceedings of the symposium Microstructural Processes in Irradiated Materials, edited by G. E. Lucas, L. L. Snead, M. A. Kirk, and R. G. Elliman, (Materials Research Society, Warrendale, PA, 2001).

"Correlating Radiation Exposure with Embrittlement: Comparative Studies of Electron and Neutron Irradiated Pressure Vessel Alloys,” **D.E. Alexander**, B.J. Kestel, L.E. Rehn, G.R. Odette, G.E. Lucas, D. Lingensmith, D. Gragg, S. Seifert and P.R. Jemian, Reactor Dosimetry, ASTM STP 1398, edited by John G. Williams, David W. Vehar, Frank H. Ruddy and David M. Gilliam (American Society for Testing and Materials, West Conshohocken, PA, 2000), pp. in press.

"Understanding the Role of Defect Production in Radiation Embrittlement of Reactor Pressure Vessels,” **D.E. Alexander**, L.E. Rehn, G.R. Odette, G.E. Lucas, D. Klingensmith and D. Gragg, Ninth International Symposium on Environmental Degradation of Materials in Nuclear Power Systems-Water Reactors, edited by S. Bruemmer, P. Ford and G. Was (The Minerals, Metals & Materials Society, Warrendale, PA, 1999), pp. 827-833.

"Modeling the Post-Yield Flow Behavior After Neutron and Electron Irradiation of Steels and Iron-Base Alloys," R.J. DiMelfi, **D.E. Alexander** and L.E. Rehn, Microstructural Processes in Irradiated Materials, Vol. 540, edited by S.J. Zinkle, G.E. Lucas, R.C. Ewing and J.S. Williams (Materials Research Society, Warrendale, PA, 1999), pp. 463-469.

"Exploring the Use of Pulsed Irradiations for Studying the Transient Sink Formed by Cascade Producing Radiation,”

D.E. Alexander, Microstructural Processes in Irradiated Materials, Vol. 540, edited by S.J. Zinkle, G.E. Lucas, R.C. Ewing and J.S. Williams (Materials Research Society, Warrendale, PA, 1999), pp. 673-678.

"Anomalous Small-Angle X-Ray Scattering Characterization of Model Pressure Vessel Alloy Microstructures," **D.E. Alexander**, B.J. Kestel, P.R. Jemian, G.R. Odette, D. Klingensmith and D. Gragg, Microstructural Processes in Irradiated Materials, Vol. 540, edited by S.J. Zinkle, G.E. Lucas, R.C. Ewing and J.S. Williams (Materials Research Society, Warrendale, PA, 1999), pp. 415-463.

"Deformation Behavior in Reactor Pressure Vessel Steels as a Clue to Understanding Irradiation Hardening," DiMelfi, R. J., **D.E. Alexander** and L.E. Rehn, Proceedings of the 6th International Conference on Nuclear Engineering, (published jointly by ASME, JSME, SFEN, 1998), paper number 6079.

"The Role of Gamma Rays and Freely-Migrating Defects in Reactor Pressure Vessel Embrittlement," **D.E. Alexander** and L.E. Rehn, Proceedings of the 9th International Symposium on Reactor Dosimetry, edited by H.A. Abderrahim, P. D'Hondt and B. Osmera (World Scientific Publishing, Singapore, 1998), pp. 508-515.

"Post-Yield Strain Hardening Behavior as a Clue to Understanding Irradiation Hardening," R.J. DiMelfi, and **D.E. Alexander**, Journal of Nuclear Materials **252**, 171-177 (1998).

"In-Situ Irradiation Studies on the Effects of Helium on the Microstructural Evolution of V-3.8 Cr-3.9 Ti," Doraiswamy, N., B. Kestel and **D.E. Alexander**, Microstructure Evolution During Irradiation, Vol. 439, edited by I.M. Robertson, G.S. Was, L.W. Hobbs and T.D. de la Rubia (Materials Research Society, Pittsburgh, PA, 1997), pp. 337-341.

"Defect Production Considerations for Gamma Ray Irradiation of Reactor Pressure Vessel Steels," **D.E. Alexander**, Journal of Nuclear Materials **240**, 196-204 (1997).

"Electron Irradiation-Induced Mechanical Property Changes in Reactor Pressure Vessel Alloys," **D.E. Alexander**, L.E. Rehn, G.R. Odette and G.E. Lucas, Thermodynamics and Kinetics of Phase Transformations, Vol. 398, edited by J.S. Im, B. Park, A.L. Greer and G.B. Stephenson (Materials Research Society, Pittsburgh, PA, 1996), pp. 177-182.

"Gamma-Ray (Electron) Irradiation Effects on Tensile Properties of Ferritic Alloys," **D.E. Alexander**, K. Farrell and R.E. Stoller, Journal of Nuclear Materials **228**, 68-76 (1996).

"TEM Studies for DIGM in Kr Ion Irradiated AU-CU Bilayers" G. Yuzun, **D.E. Alexander**, and L.E. Rehn, Trans. Nonferrous Met. Society China, (General Research Institute for Nonferrous Metals, Beijing 100088), Vol. 6, No. 3, 1996

"Analysis of Gamma Ray Displacement Damage in Light Water Reactor Pressure Vessels," **D.E. Alexander**, and L.E. Rehn, Seventh International Symposium on Environmental Degradation of Materials in Nuclear Power Systems Water Reactors, edited by G. Airey, et al. (NACE International, Houston, TX, 1995), pp. 783-794.

"Gamma Ray-Induced Embrittlement of Pressure Vessel Alloys," **D.E. Alexander**, K. Farrell, R.E. Stoller and L.E. Rehn, Microstructure of Irradiated Materials, Vol. 373, edited by I.M. Robertson, L.E. Rehn, S.J. Zinkle and W.J. Phythian (Materials Research Society, Pittsburgh, PA, 1995), pp. 155-163.

"Gamma-Ray Displacement Damage in the Pressure Vessel of the Advanced Boiling Water Reactor," **D.E. Alexander**, and L.E. Rehn, Journal of Nuclear Materials **217**, 213-216 (1994).

"The Contribution of High Energy Gamma Rays to Displacement Damage in LWR Pressure Vessels," **D.E. Alexander**, and L.E. Rehn, Journal of Nuclear Materials **209**, 212-214 (1994).

"Neutron-Induced Collision Cascade Mixing in Nb/V Superlattices," **D.E. Alexander**, E.E. Fullerton, P.M. Baldo, C.H. Sowers and L.E. Rehn, Nuclear Instruments and Methods in Physics Research **B 90**, 344-348 (1994).

"Temperature-Dependent Ion Mixing," Rehn, L.E. and **D.E. Alexander**, Laser and Ion Beam Modification of Materials, Vol. 17, edited by I. Yamada, et al. (Elsevier Science B.V., Amsterdam, Holland, 1994), pp. 571-577.

"Modulation Wavelength Dependence of Ion Mixing in Metallic Superlattices," **D.E. Alexander**, E.E. Fullerton, P.M. Baldo, C.H. Sowers and L.E. Rehn, Materials Synthesis and Processing Using Ion Beams, Vol. 316, edited by R.J. Cullbertson, O.W. Holland, K.S. Jones and K. Maex (Materials Research Society, Pittsburgh, PA, 1994), pp. 271-276.

"Diffusion-Induced Grain Boundary Migration During Ion Beam Mixing of Au/Cu Bilayers," **D.E. Alexander**, P.M. Baldo and L.E. Rehn, Nuclear Instruments and Methods in Physics Research B80/81, 412-416 (1993).

"The Effect of DIGM and Irradiation-Induced Grain Growth on Interdiffusion in Bilayer Ion-Beam Mixing Experiments," **D.E. Alexander**, L.E. Rehn, P.M. Baldo and Y. Gao, Beam-Solid Interactions: Fundamentals and Applications, Vol. 279, edited by M. Nastasi, L.R. Harriott, N. Herbots and R.S. Averback (Materials Research Society, Pittsburgh, PA, 1993), pp. 497-502.

"Cross-Sectional TEM Studies of DIGM in Irradiated Au-Cu Bilayers," Y. Gao, **D.E. Alexander** and L.E. Rehn, Beam-Solid Interactions: Fundamentals and Applications, Vol. 279, edited by M. Nastasi, L.R. Harriott, N. Herbots and R.S. Averback (Materials Research Society, Pittsburgh, PA, 1993), pp. 369-374.

"Enhancement of Diffusion-induced Grain Boundary Migration by Ion Irradiation," **D.E. Alexander**, L.E. Rehn, P.M. Baldo and Y. Gao, Gold Bulletin **26**, 67 (1993).

"Enhancement of Diffusion-Induced Grain Boundary Migration by Ion Irradiation," **D.E. Alexander**, L.E. Rehn, P.M. Baldo and Y. Gao, Applied Physics Letters **62**, 1597-1599 (1993).

"Thermal-Spike Treatment of Ion-Induced Grain Growth: Theory and Experimental Comparison," **D.E. Alexander**, and G.S. Was, Physical Review B **47**, 2983-2994 (1993).

"The Effect of Ion Irradiation on Inert Gas Bubble Mobility," **D.E. Alexander**, and R.C. Birtcher, Journal of Nuclear Materials 191-194, 1289-1294 (1992).

"Application of a Thermal Spike Model to Experimental Ion-Induced Grain Growth Data," **D.E. Alexander** and G.S. Was, Surface and Coatings Technology **51**, 333-337 (1992).

"Interdiffusion and Grain Boundary Migration in Au/Cu Bilayers During Ion-Irradiation," **D.E. Alexander**, in Phase Formation and Modification by Beam-Solid Interactions, Vol. 235, edited by G.S. Was, L.E. Rehn and D.M. Follstaedt (Materials Research Society, Pittsburgh, PA, 1992), pp. 559-564

"The Effect of Ion Irradiation on Inert Gas Bubble Mobility," **D.E. Alexander**, and R.C. Birtcher, Phase Formation and Modification by Beam-Solid Interactions, Vol. 235, edited by G.S. Was, L.E. Rehn and D.M. Follstaedt (Materials Research Society, Pittsburgh, PA, 1992), pp. 545-550.

"Thermal Spike Model of Ion-Induced Grain Growth," **D.E. Alexander**, and G.S. Was, Evolution of Thin Film and Surface Microstructure, Vol. 202, edited by C.V. Thompson, J. Y. Tsao and D. J. Sorolovitz (Materials Research Society, Pittsburgh, PA, 1991), pp. 205.

"Ion-Induced Grain Growth in Multilayer and Coevaporated Metal Alloy Thin Films," **D.E Alexander**, G.S. Was and L.E. Rehn, Nuclear Instruments and Methods in Physics Research **B59/60**, 462466 (1991).

"The Heat-of-Mixing Effect on Ion-Induced Grain Growth," **D.E. Alexander**, G.S. Was and L.E. Rehn, Journal of Applied Physics **70**, 1252-1260 (1991).

"Phase Formation in Ion-Irradiated and Annealed Ni-Rich Ni-Al Thin Films," **D.E. Alexander**, G.S. Was and L.E. Rehn, Journal of Applied Physics **69**, 2021-2027 (1991).

Grain Growth and Phase Formation in Ion Irradiated Metal Alloy Thin Films, **D.E. Alexander**, Ph.D. Thesis, University of Michigan, Ann Arbor, MI, 1990.

"Grain Growth and Phase Formation in Ion Irradiated/Annealed Thin Ni-Al Alloy Films", **D.E Alexander**, G.S. Was and L.E. Rehn, Beam-Solid Interactions: Physical Phenomena, Vol. 157, edited by J.A. Knapp, P. Borgesen and R.A. Zuhr (Materials Research Society, Pittsburgh, PA, 1990), pp. 155-160.

"The Effect of Ion Beam Surface Modifications on Fatigue Crack Initiation in Polycrystalline Nickel," Morrison, D. J., J.W. Jones, **D.E. Alexander**, C. Kovach and G.S. Was, Materials Science and Engineering **A115**, 315-321 (1989).

"Grain Growth and Phase Morphology in Ion Beam Mixed Two Phase Ni-Al and Ni-Cr-Al Alloys," **D.E. Alexander**, G. Was and J. Eridon, Nuclear Instruments and Methods in Physics Research **B39**, 130-135 (1989).

"Laser Driven Micro-explosive Bonding of Aluminum Films to Copper and Silicon," **D.E. Alexander**, G.S Was and. F.J Mayer, Journal of Materials Science 23, 2181-2186 (1988).