**Timothy Gerald Lach, PhD**

R&D Scientist

Materials Science and Technology Division

Oak Ridge National Laboratory

**EDUCATION**

2016 **PhD**, Materials Science and Engineering

University of Illinois at Urbana-Champaign

Dissertation: *Role of Interfaces on Severe Plastic Deformation and He-Irradiation Tolerance in Cu-Nb Nanocomposites*

2010 **BS**, Materials Science and Engineering, *magna cum laude*

The Ohio State University

Specialization: Electronic Materials

**EMPLOYMENT**

Oak Ridge National Laboratory, Materials Science and Technology Division

*2024-present – R&D Scientist*

*2020-2024 – R&D Associate Scientist*

* Investigate processing-structure-properties-performance relationships in materials
* Microstructural characterization of degradation mechanisms in materials subjected to extreme thermal, mechanical, and radiation conditions
* Characterize a wide range of structural materials for nuclear energy applications including additively-manufactured stainless steel, SiC/SiC composites, yttrium hydride, Ni-based alloys, and Zr-based alloys
* Characterization using analytical scanning transmission electron microscopy (STEM), atom probe tomography (APT), focused ion beam (FIB), and analytical scanning electron microscopy (SEM)
* Contribute extensively to publications, reports, and funding proposals
* Task lead for Department of Energy (DOE) Light Water Reactor Sustainability program
* Principal investigator on multiple funded DOE- Nuclear Science User Facility (NSUF) projects
* Coordinator of FIB/SEM instruments in Low Activation Materials Development and Analysis (LAMDA) laboratory
* Associate Editor: *Frontiers in Nuclear Engineering* – *Nuclear Materials*

Pacific Northwest National Laboratory, Nuclear Sciences Division

2018-2020 – *Materials Scientist II*

* Scientist and Engineer Development Program
* Microstructural characterization of degradation mechanisms in materials subjected to extreme thermal, mechanical, electrochemical/ corrosion, and radiation conditions
* Characterized materials ranging from stainless steels and ferritic steels to Zr-cladding oxide and actinide/ transuranic-bearing materials
* Characterization using aberration-corrected STEM, FIB/SEM, and APT
* Investigate processing-structure-properties-performance relationships in materials
* Contribute extensively to publications, reports, and funding proposals

2016-2018 – *Postdoctoral Research Scientist*

Mentors: Dr. Thak Sang Byun and Dr. Dallas Reilly

* Microstructural and mechanical characterization of thermal-aging degradation in duplex stainless steels – producing comprehensive, predictive model for aging degradation in nuclear power plant coolant system materials
* Characterization of fractionation of isotopes and trace elements in U and Pu metals
* Characterization of microstructural evolution of noble metal phase particles in spent nuclear fuel materials

University of Illinois at Urbana-Champaign, Materials Science and Engineering

2010-2016 – *Graduate Research Assistant*

Advisors: Prof. Pascal Bellon and Prof. Robert Averback

* Processing and microstructural characterization of nano-scale Cu-based immiscible metal alloys resistant to irradiation and severe plastic deformation to improve understanding of materials in extreme environments for future fission/ fusion applications
* Characterization of materials by transmission electron microscopy (TEM), APT, FIB/SEM, and X-ray diffraction
* Group lab space manager

**PROFICIENCIES AND SKILLS**

***Interpersonal/ Communication:*** Leadership and collaboration on research projects; written multiple publications in high impact journals; presented at international conferences to the materials research community

***Engineering and Design:*** Design of experiments to efficiently meet and exceed sponsor needs; use and knowledge of engineering principles across disciplines

***Materials Characterization***: Atom probe tomography (APT), Analytical Electron Microscopy (TEM, S/TEM, and FIB/SEM), X-Ray Diffraction (XRD), Rutherford Back Scattering (RBS), Mechanical testing

***Materials Synthesis and Processing***: Nanostructured bulk metal processing by severe plastic deformation, powder metallurgy, physical vapor deposition (PVD) and photolithography of thin films, ion irradiation and processing

**AFFILIATIONS**

The Minerals, Metals, and Materials Society (TMS)

Member, Nuclear Materials Committee-TMS

Microscopy Society of America (MSA)

Symposium Lead for M&M – 2023: “Microscopy and Microanalysis of Materials under Multiple Environmental Extremes”

Symposium Lead for M&M – 2025: “High-Resolution Microscopy and Microanalysis of Materials subjected to Extreme Environments”

American Nuclear Society (ANS)

**RESEARCH INTERESTS**

* Investigate interface structure-property relationships in materials via advanced characterization
* Advanced materials for clean energy applications
* Nanostructured, coarsening-resistant and radiation-resistant materials
* Additive manufacturing and powder metallurgy
* Develop materials for advanced energy applications using innovative processing techniques

**PUBLICATIONS**

2024 “Recent progress in analysis of strain-induced phenomena in irradiated metallic materials and advanced alloys using SEM-EBSD in-situ tensile testing.” M.N. Gussev, D.A. McClintock, T.S. Byun, and **T.G. Lach**. *Current Opinion in Solid State and Materials Science* **28** (2024) 101132 <https://doi.org/10.1016/j.cossms.2023.101132>

2024 “Deformation and Fracture Behavior of Additively Manufactured 316L Stainless Steel.” T.S. Byun, M.N. Gussev, and **T.G. Lach**. *JOM* **76** (2024) 362 <https://doi.org/10.1007/s11837-023-06224-4>

2024 “Characteristics of oxide-dispersion strengthened alloys produced by high-temperature severe deformation.” T.S. Byun, **T.G. Lach**, Y.R. Lin, D.A. Collins, K. Epps, and D.T. Hoelzer. *Journal of Nuclear Materials* **597** (2024) 155129 <https://doi.org/10.1016/j.jnucmat.2024.155129>

2023 “Impact of nano-scale cavities on hydrogen storage and retention in yttrium hydride.” M.N. Cinbiz, **T.G. Lach**, M. Topsakal, A.G. Le Coq, and K.D. Linton. *Materialia* **32** (2023) 101933 <https://doi.org/10.1016/j.mtla.2023.101933>

2023 “Multimodal Characterization of Stored Energy and Gas-Filled Cavities in FCC Alloys Irradiated with Spallation Neutrons and High-Energy Protons.” **T.G. Lach**, M.N. Gussev, K.A. Unocic, W. Zhong, A.J. Godfrey, and D.A. McClintock. *Microscopy and Microanalysis* **29** (2023) 1538 <https://doi.org/10.1093/micmic/ozad067.792>

2023 “Post Irradiation Examination of Pressurized Water Reactor Stainless Steel Internal Components.” **T.G. Lach** and X. Chen. *Proceedings of Pressure Vessels and Piping, ASME* (2023) 107347 <https://doi.org/10.1115/PVP2023-107347>

2023 “Predicting the creep-rupture lifetime of a cast austenitic stainless steel using Larson-Miller and Wilshire parametric approaches.” M.L. Santella, P.F. Tortorelli, M. Render, H. Wang, **T.G. Lach**¸ B.A. Pint, P.J. Maziasz, V. Cedro III, and X. Chen. *International Journal of Pressure Vessels and Piping* **205** (2023) 105006 <https://doi.org/10.1016/j.ijpvp.2023.105006>

2023 “Origin, parameters, and underlying deformation mechanisms of propagating deformation bands in irradiated 316L stainless steel.” M.N. Gussev, D.A. McClintock, and **T.G. Lach**. *Acta Materialia* **242** (2023) 118434 <https://doi.org/10.1016/j.actamat.2022.118434>

2022 “Deformation Mechanism Transition in Additively Manufactured Compositionally Graded Fe-Base Alloys.” T.S. Byun, M.N. Gussev, N. Bibhanshu, and **T.G. Lach**. *JOM* **74** (2022) 4042 <https://doi.org/10.1007/s11837-022-05401-1>

2022 “Observations of radiation-enhanced ductility in irradiated Inconel 718: Tensile properties, deformation behavior, and microstructure.” D.A. McClintock, M.N. Gussev, C. Campbell, K. Mao, **T.G. Lach**, W. Lu, J.A. Hachtel, and K.A. Unocic. *Acta Materialia* **231** (2022) 117889 <https://doi.org/10.1016/j.actamat.2022.117889>

2022 “Dynamic substrate reactions during room temperature heavy ion irradiation of CoCrCuFeNi high entropy alloy thin films.” **T.G. Lach**, C.M. Silva, Y. Zhou, W.L. Boldman, P.D. Rack, W.J. Weber, and Y. Zhang. *Npj Material Degradation* **6** (2022) 1 <https://doi.org/10.1038/s41529-022-00260-2>

2022 “Characterization of radiation damage in 3D printed SiC.” **T.G. Lach**, A.G. Le Coq, K.D. Linton, K.A. Terrani, and T.S. Byun. *Journal of Nuclear Materials* **559** (2022) 153459 <https://doi.org/10.1016/j.jnucmat.2021.153459>

2022 “Role of electronic energy loss on defect production and interface stability: Comparison between ceramic materials and high-entropy alloys.” Y. Zhang, C.M. Silva, **T.G. Lach**, M.A. Tunes, Y. Zhou, L. Nuckols, W.L. Boldman, P.D. Rack, S.E. Donnelly, L. Jiang, L. Wang, and W.J. Weber. *Current Opinion in Solid State and Materials Science* **26** (2022) 101001 <https://doi.org/10.1016/j.cossms.2022.101001>

2022 “Identifying chemically similar multiphase nanoprecipitates in compositionally complex non-equilibrium oxides via machine learning.” K.S. Mao, T.J. Gerczak, J.M. Harp, C.S. McKinney, **T.G. Lach**, O. Karakoc, A.T. Nelson, K.A. Terrani, C.M. Parish, and P.D. Edmondson. *Communications Materials* **3** (2022) 1 <https://doi.org/10.1038/s43246-022-00244-4>

2022 “A comprehensive study of the effects of long-term thermal aging on the fracture resistance of cast austenitic stainless steels.” D.A. Collins, E.L. Carter, **T.G. Lach**, and T.S. Byun. *Nuclear Engineering and Technology* **54** (2022) 709 <https://doi.org/10.1016/j.net.2021.08.022>

2021 “Evolution of the role of molybdenum in duplex stainless steels during thermal aging: From enhancing spinodal decomposition to forming heterogeneous precipitates.” **T.G. Lach**, D.A. Collins, and T.S. Byun. *Journal of Nuclear Materials* **557** (2021) 153268 <https://doi.org/10.1016/j.jnucmat.2021.153268>

2021 “Correlative STEM-APT characterization of radiation-induced segregation and precipitation of in-service BWR 304 stainless steel.” **T.G. Lach,** M.J. Olstza, S.D. Taylor, K.H. Yano, D.J. Edwards, T.S. Byun, P.H. Chou, and D.K. Schreiber. *Journal of Nuclear Materials* **549** (2021) 152894 <https://doi.org/10.1016/j.jnucmat.2021.152894>

2021 “Deuterium permeation and retention in 316L Stainless Steel Manufactured by Laser Powder Bed Fusion.” X. Hu, **T.G. Lach**, and K.A. Terrani. *Journal of Nuclear Materials* **548** (2021) 152871 <https://doi.org/10.1016/j.jnucmat.2021.152871>

2021 “Mechanical behavior of additively manufactured and wrought 316L stainless steels before and after neutron irradiation.” T.S. Byun, B.E. Garrison, M.R. McCallister, X. Chen, M.N. Gussev, **T.G. Lach**, A.G. Le Coq, K.D. Linton, C.B. Joslin, K. Carver, F.A. List, R.R. Dehoff, and K.A. Terrani. *Journal of Nuclear Materials* **548** (2021) 152849 <https://doi.org/10.1016/j.jnucmat.2021.152849>

2021 “Correlating Nanoscale Secondary Ion Mass Spectrometry and Atom Probe Tomography Analysis of Uranium Enrichment in Metallic Nuclear Fuel.” E. Kautz, J. Cliff, **T.G. Lach**, D.D. Reilly, and A. Devaraj. *Analyst* **146** (2021) 69 <https://doi.org/10.1039/d0an01831g>

2021 “Bulk and Short-circuit anion diffusion in epitaxial Fe2O3 films quantified using buried isotopic tracer layers.” T.C. Kaspar, S.D. Taylor, K.H. Yano, **T.G. Lach**, Y. Zhou, Z. Zhu, A.A. Kohnert, E.K. Still, P. Hosemann, S.R. Spurgeon, and D.K. Schreiber. *Advanced Materials Interfaces* **8** (2021) 2001768 <https://doi.org/10.1002/admi.202001768>

2021 “Radiation-Enhanced Anion Transport in Hematite.” K.H. Yano, A. Kohnert, A. Banerjee, D.J. Edwards, E. Holby, T. Kaspar, H. Kim, **T.G. Lach**, S.D. Taylor, Y. Wang, B.P. Uberuaga, and D.K. Schreiber. *Chemistry of Materials* **33** (2021) 2307 <https://doi.org/10.1021/acs.chemmater.0c04235>

2021 “Irradiation stability and thermomechanical properties of 3D-printed SiC.” K.A. Terrani, **T.G. Lach**, H. Wang, A.G. Le Coq, K.D. Linton, C.M. Petrie, T. Koyanagi, and T.S. Byun. J*ournal of Nuclear Materials* **551** (2021) 152980 <https://doi.org/10.1016/j.jnucmat.2021.152980>

2020 “A pathway to synthesizing single-crystal Fe and FeCr films.” B. Derby, J. Cooper, **T.G. Lach**, E. Martinez, H. Kim, J.K. Baldwin, D. Kaoumi, D.J. Edwards, D.K. Schreiber, B.P. Uberuaga, and N. Li. *Surface and Coatings Technology* **403** (2020) 126346

<https://doi.org/10.1016/j.surfcoat.2020.126346>

2020 “Degradation of impact toughness in cast stainless steels during long-term thermal aging.” T.S. Byun, D.A. Collins, **T.G. Lach**, and E.L. Carter. *Journal of Nuclear Materials* **542** (2020) 152524 <https://doi.org/10.1016/j.jnucmat.2020.152524>

2020 “Precipitation-site competition in duplex stainless steels: Cu clusters vs spinodal decomposition interfaces as nucleation sites during thermal aging.” **T.G. Lach**, W.E. Frazier, J. Wang, A. Devaraj, and T.S. Byun. *Acta Materialia* **196** (2020) 456

<https://doi.org/10.1016/j.actamat.2020.05.017>

2020 “Monte Carlo simulations of Cu/G-phase co-precipitation in duplex stainless steels.” W.E. Frazier, **T.G. Lach**, and T.S. Byun. *Acta Materialia* **194** (2020) 1

<https://doi.org/10.1016/j.actamat.2020.03.053>

2020 “Distribution of Metallic Fission Product Particles in the Cladding Liner of Spent Nuclear Fuel.” R.C. Clark, M.A. Conroy, **T.G. Lach**, E.C. Buck, K. Pellegrini, B.K. McNamara, and J.M. Schwantes, R. Clark. *NPJ-Materials Degradation* **4** (2020) 4

<https://doi.org/10.1038/s41529-019-0107-0>

2020 “A new non-diffusional gas bubble production route in used nuclear fuel: implications for fission gas release, cladding corrosion and next generation of fuel design.” J.M. Schwantes, J.L. Bair, E.C. Buck, R. Devanathan, S.H. Kessler, **T.G. Lach**, J.M Lonergren, B.K. McNamara, C.J. Palmer, and R.C. Clark. *Physical Chemistry Chemical Physics* **22** (2020) 6086 <https://doi.org/10.1039/C9CP05363H>

2020 “Focused ion beam for improved spatially resolved mass spectrometry.” D.D. Reilly, B.W. Arey, C.L. Beck, E.C. Buck, J.B. Cliff, A.M. Duffin, **T.G. Lach**, K.W.E. Springer, S.J. Tedrow, and M.M. Zimmer. *Talanta* **211** (2020) 120720

<https://doi.org/10.1016/j.talanta.2020.120720>

2020 “Direct observations of Pd-Te compound formation within noble metal inclusions in spent nuclear fuel.” S.H. Kessler, **T.G. Lach**, K.E. Garrett, M.A. Conroy, D.G. Abrecht, J.M. Schwantes, and R.A. Clark. *Journal of Nuclear Materials* **538** (2020) 152249

<https://doi.org/10.1016/j.jnucmat.2020.152249>

2019 “Fission recoil-induced microstructural evolution of the fuel-cladding interface [FCI] in high burnup BWR fuel.” **T.G. Lach,** D.J. Edwards, J.M. Schwantes, E.C. Buck, B.K. McNamara, and R.A. Clark. *Journal of Nuclear Materials* **521** (2019) 120

<https://doi.org/10.1016/j.jnucmat.2019.04.044>

2019 “Chemical and isotopic characterization of noble metal phase from commercial UO2 Fuel.” K.L. Pellegrini, C.Z. Soderquist, S.D. Shen, E.J. Krogstad, C.J. Palmer, K. Gerez, E.C. Buck, **T.G. Lach**, J.M. Schwantes, and R.A. Clark. *Analytical Chemistry* **91** (2019) 6522

<https://doi.org/10.1021/acs.analchem.8b05549>

2019 “Effects of thermal aging on the fracture toughness of cast stainless steel CF8.” D.A. Collins, E.L. Barkley, **T.G. Lach**, and T.S. Byun. *Journal of Pressure Vessels and Piping* **173** (2019) 45 <https://doi.org/10.1016/j.ijpvp.2019.04.017>

2019 “Extraction of plutonium-containing microcrystals from Hanford soil using a focused ion beam for single-crystal X-ray diffraction analysis.” J.F. Corbey, D.D. Reilly, L.E. Sweet, and **T.G. Lach**. *Journal of Applied Crystallography* **52** (2019) part 6

<https://doi.org/10.1107/S1600576719012299>

2019 “Characterization of slag and metal from uranium bomb reduction: morphology, speciation, and the search for thorium.” D.D. Reilly, M.T. Athon, L. Kovarik, and **T.G. Lach**. *Materials Characterization* **158** (2019) 109948<https://doi.org/10.1016/j.matchar.2019.109948>

2019 “Changing the rules of the game: used fuel studies outside of a remote handling facility.” J.M. Schwantes, J.M. Lonergan, D.E. Robertson, **T.G. Lach**, J.A. Soltis, K.L. Pellegrini, M.A. Conroy, and R.A. Clark. *Journal of Radioanalytical and Nuclear Chemistry* ***322*** *(2019) 1267* <https://doi.org/10.1007/s10967-019-06921-y>

2019 “Fracture property degradation in cast austenitic stainless steels after long-term thermal aging.” T.S. Byun, **T.G. Lach**, D.A. Collins, and C. Jang. *Proceedings – Env/Deg2019* (2019) 294-302

2018 “Co-dependent microstructural evolution pathways in metastable δ-ferrite in cast austenitic stainless steels during thermal aging.” **T.G. Lach**, A. Devaraj, K.J. Leonard, and T.S. Byun. *Journal of Nuclear Materials* **510** (2018) 382

<https://doi.org/10.1016/j.jnucmat.2018.08.038>

2017 “Mechanical property degradation and microstructural evolution of cast austenitic stainless steels under short-term thermal aging.” **T.G. Lach**, T.S. Byun, and K.J. Leonard. *Journal of Nuclear Materials* **497** (2017) 139 <https://doi.org/10.1016/j.jnucmat.2017.07.059>

2017 “Microstructural evolution of cast austenitic stainless steels under accelerated thermal aging.” **T.G. Lach** and T.S. Byun. *Proceedings – Env/Deg2017* ***2*** (2017) 643

2017 “Influence of δ-ferrite content on thermal aging-induced mechanical property degradation in cast stainless steels.” T.S. Byun, **T.G. Lach**, Y. Yang, and C. Jang. *Proceedings – Env/Deg2017* **2** (2017) 613

2015 “Role of interfaces on trapping of He in 2D and 3D Cu-Nb nanocomposites.” **T.G. Lach**, E.H. Ekiz, R.S. Averback, N.A. Mara, and P. Bellon. *Journal of Nuclear Materials* **466** (2015) 36 <https://doi.org/10.1016/j.jnucmat.2015.07.020>

2015 “Self-organization of Cu-Ag during controlled severe plastic deformation at high temperatures.” S.N. Arshad, **T.G. Lach**, J. Ivanisenko, D. Setman, P. Bellon, S.J. Dillon, and R.S. Averback. *Journal of Materials Research* **30** (2015) 1943

<https://doi.org/10.1557/jmr.2015.119>

2014 “Microstructural evolution of nanolayered Cu-Nb composites to high pressure torsion.” E. Ekiz, **T.G. Lach**, R.S. Averback, N.A. Mara, M. Pouryazdan, H. Hahn, and P. Bellon. *Acta Materialia* **72** (2014) 178 <https://doi.org/10.1016/j.actamat.2014.03.040>

2013 “Dependence of shear-induced mixing on length scale.” S.N. Arshad, **T.G. Lach**, M. Pouryazdan, H. Hahn, P. Bellon, S.J. Dillon, and R.S. Averback. *Scripta Materialia* **68** (2013) 215 <https://doi.org/10.1016/j.scriptamat.2012.10.027>

**REPORTS**

2023 “Microstructural Characterizations of Two High Fluence Baffle-Former Bolts Retrieved from a Westinghouse Two-loop Downflow Type PWR.” **T.G. Lach**, M.N. Gussev, and X. Chen. ORNL/TM-2023/3078 M3LW-23OR0402055

2023 “Microstructure and In-Service Degradation of Baffle-Former Bolts – In-Core Components of Light-Water Reactors.” M.N. Gussev, **T.G. Lach**, and X. Chen. ORNL/TM-2023/3118

M3LW-23OR0402027

2022 “Microstructural Characterization of the Second High Fluence Baffle-Former Bolt Retrieved from a Westinghouse Two-loop Downflow Type PWR.” **T.G. Lach**, X. Chen, and T.M. Rosseel. ORNL/TM-2022/2668 <https://doi.org/10.2172/1897832>

2021 “Mechanical Properties of Additively Manufactured 316L Stainless Steel Before and After Neutron Irradiation: FY21” T.S. Byun, D.A. Collins, A.G. LeCoq, **T.G. Lach**, K.D. Linton, M.N. Gussev, J.W. Werden, M.R. McAlister, X. Chen, C.B. Joslin, J.K. Carver, F.A. List, and B.R. Betzler. ORNL/TM-2021/2121 <https://doi.org/10.2172/1828253>

2021 “Mechanical and Thermophysical Properties of 3D-Printed SiC Before and After Neutron Irradiation – FY21” T.S. Byun, **T.G. Lach**, C.M. Parish, H. Wang, A.A. Trofimov, D.A. Collins, A.G. LeCoq, K.D. Linton, M.D. Richardson, B.C. Jolly, M.P. Trammell, A.T. Schumacher, G. Vasudevamurthy, T. Koyanagi, and K.A. Terrani. ORNL/TM-2021/2006 <https://doi.org/10.2172/1814305>

**CONFERENCE PRESENTATIONS**

2024 “Multimodal characterization of radiation and transmutation extremes in SNS components.” **T.G. Lach - Invited**, M.N. Gussev, K.A. Unocic, and D.A. McClintock. *CAARI-SNEAP 2024*

2024 “Stability of H/He-filled nanocavities in Alloy 718 after low temperature irradiation with simultaneous high energy protons and spallation neutrons.” **T.G. Lach**, K.A. Unocic, M.N. Gussev, A.J. Godfrey, W. Zhong, and D.A. McClintock. *TMS 2024 Annual Meeting and Exhibition:* Phase Stability in Extreme Environments II

2023 “Comparison of microstructural evolution between commercial and test reactor neutron-irradiated wrought and/or AM 316 stainless steel.” **T.G. Lach**, M.N. Gussev, T.S. Byun, A.G. LeCoq, K.D. Linton, and X. Chen. *Materials in Nuclear Energy Systems (MiNES) 2023*

2023 “Multimodal Characterization of Stored Energy and Gas-filled Cavities in Alloy 718 Irradiated with Spallation Neutrons and High-energy Protons.” **T.G.** Lach, K.A. Unocic, M.N. Gussev, A.J. Godfrey, W. Zhong, and D.A. McClintock. *Microscopy and Microanalysis 2023*

2023 “PIE of baffle-former bolts harvested from a Westinghouse two-loop downflow type PWR.” **T.G. Lach**, M.N. Gussev, and X. Chen. *ASME – Pressure Vessels and Piping 2023*

2022 “Characterization of Simultaneous High-energy Proton and Spallation-Neutron Radiation Effects in Structural Alloys.” **T.G. Lach**, M.N. Gussev, and D.A. McClintock. *MS&T2022: Advanced Characterization of Materials for Nuclear, Radiation, and Extreme Environments III* symposium

2022 “Single-step Aging Treatment on Cast Haynes 282 Ni-based Alloy – Microstructure and Mechanical Behavior.” **T.G. Lach** and X. Chang. *MS&T2022: Alloy Phase Transformations at Elevated Temperatures* symposium

2021 “Microstructural Characterization of Radiation Effects in 3D printed SiC” **T.G. Lach**, T. Koyanagi, C.M. Parish, T.S. Byun, and K.A. Terrani. *TMS 2021 Annual Meeting and Exhibition*: *Ceramic Materials for Nuclear Energy Research and Applications — Advanced Ceramics Concepts*

2020 “Post-Irradiation Examination of 3D-Printed SiC.” **T.G. Lach**, H.Wang, T. Koyanagi, C.M. Parish, Y. Zhang, T.S. Byun, and K.A. Terrani. *American Nuclear Society 2020 Winter Meeting*

2019 “Interdependent and Nonuniform Microstructural Evolution Pathways of Thermal Aging Degradation of Cast Austenitic Stainless Steels.” **T.G. Lach**, W.E. Frazier, A. Devaraj, D.A. Collins, E.L. Barkley, and T.S. Byun. *Materials in Nuclear Energy Systems* (MiNES) *Meeting 2019*

2019 “Fracture Property Degradation of Cast Austenitic Stainless Steels after Long-Term Thermal Aging.” **T.G. Lach**, T.S. Byun, D.A. Collins, K. Kruska, and C. Jang. *19th International Conference on Environmental Degradation of Materials in Nuclear Power Systems – Water Reactors*.

2019 “Co-dependent Pathways of Thermal Aging Degradation of Cast Austenitic Stainless Steels Characterized by Atom Probe Tomography, Electron Microscopy, and Mechanical Testing.” *TMS 2019 Annual Meeting and Exhibition:* Phase Transformations and Microstructural Evolution

2018 “Co-dependent Microstructural Evolution Pathways in Ferrite and at Ferrite-Austenite Phase Boundary in Cast Austenitic Stainless Steels during Thermal Aging.” **T.G. Lach**, A. Devaraj, T.S. Byun. *Nuclear Materials Conference 2018*

2018 “Fission-Product Metal Phase Particles in the Fuel-Cladding Interaction Region in High Burn-up BWR Fuel.” **T.G. Lach**, E.G. Buck, B.K. McNamara, M.A. Conroy, J.M. Schwantes, R. Clark. *Nuclear Materials Conference 2018*

2018 “Atom Probe Tomography Analysis of Pu and Oxidation in Air.” **T.G. Lach,** D. Perea, D.D. Reilly. *American Chemical Society Northwest Regional Meeting 2018*

2018 “Mechanistic Study of Microstructural Evolution of Ferrite-Austenite Phase Boundary in Cast Duplex Stainless Steels after 10000 Hours Thermal Aging.” **T.G. Lach**, A. Devaraj, T.S. Byun. *Atom Probe Tomography & Microanalysis 2018:* Metals and Alloys topic area.

2018 “Atom Probe Tomography Study of Microstructural Evolution of Cast Duplex Stainless Steels after 10,000 Hour Thermal Aging.” **T.G. Lach**, A. Devaraj, T.S. Byun. *TMS 2018 Annual Meeting and Exhibition:* Materials and Fuels for the Current and Advanced Nuclear Reactors VII.

2017 “Thermal Aging Phenomena of Cast Austenitic Stainless Steels.” **T.G. Lach**, T.S. Byun. *18th International Conference on Environmental Degradation of Materials in Nuclear Power Systems – Water Reactors*.

2017 “Thermal Aging Degradation of Cast Stainless Steels in LWR Systems.” **T.G. Lach**, T.S. Byun, Y. Yang, N. Overman, and K.J. Leonard. *TMS 2017 Annual Meeting and Exhibition*: Microstructural Processes in Irradiated Materials.

2016 “Role of Interface Character on Microstructural Stability of Cu-Nb Nanocomposites subjected to High Pressure Torsion.” **T.G. Lach**, E.H. Ekiz-Stumphy, J. Ivanisenko, R.S. Averback, and P. Bellon. *MS&T 2016 Annual Meeting and Exhibition*: Energy-Materials for Nuclear Energy Applications.

2015 “Role of Interfaces on Trapping He in 2D and 3D Cu-Nb Nanocomposites.” **T.G. Lach**, E. Ekiz, R.S. Averback, and P. Bellon. TMS 2015 Annual Meeting and Exhibition: Microstructural Processes in Irradiated Materials.

2013 “Forced Mixing and Microstructural Evolution of Nanostructured Cu-V Alloys subjected to Severe Plastic Deformation.” *Hard Materials Seminar*. Dept. of Materials Science and Engineering, University of Illinois.

**RECONGNITIONS**

2019 Exceptional Contribution Award – PNNL

2016 Outstanding Performance Award – PNNL

2010 Hamer Fellowship, University of Illinois at Urbana-Champaign

2010 University Scholar, The Ohio State University

2010 Honda iDream Design Competition, 3rd place

Proposal: *Energy Harvesting for Electric Vehicles by Means of Piezoelectrics*.

**TEACHING EXPERIENCE**

2015 Graduate Teaching Assistant, University of Illinois at Urbana-Champaign

Design of Engineering Alloys

2013- Graduate Teaching Assistant, University of Illinois at Urbana-Champaign

2015 Senior-level Metals Laboratory

2013- Graduate Teaching Assistant, University of Illinois at Urbana-Champaign

2015 Mechanical Behavior of Materials

2009 Undergraduate Teaching Assistant, The Ohio State University

Introduction to Materials Science and Engineering

**OTHER RELEVANT EXPERIENCE**

2009 Undergraduate Research Assistant, The Ohio State University

Mentor: Professor Ji-Cheng Zhao

Diffusion multiples method for developing phase diagrams in Ni-based alloys

2008 Process Improvement Internship, Special Metals Corporation, Huntington, WV

Mentor: Dr. Mark Suer

Improvement of materials usage in EAF/AOD melting/casting of superalloys and Ni alloys