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Education

2011-2014	**Doctor of Philosophy**, *University of Illinois at Urbana-Champaign*, GPA 3.96/4.00 Major: Civil and Environmental Engineering Advisor: Robert Dodds, Jr. Dissertation: *Micromechanical models of delamination in Al-Li alloys* Computational Science and Engineering Certificate
2010-2011	**Master of Science**, *University of Illinois at Urbana-Champaign*, GPA 3.96/4.00 Major: Civil and Environmental Engineering Advisor: Robert Dodds, Jr. Computational Science and Engineering Certificate
2006-2010	**Bachelor of Science**, *University of Illinois at Urbana-Champaign*, GPA 3.97/4.00 Major: Civil and Environmental Engineering, Minor: German Degree awarded with Highest Honors and University Honors

Appointments

2023-	**Group Leader**, *Argonne National Laboratory* Established the Thermal and Structural Materials Modeling and Simulations Group. Led a team of 2 staff and 4-6 postdocs on projects funded by the U.S. Department of Energy, Office of Nuclear Energy, the Office of Energy Efficiency and Renewable Energy, the U.S. Nuclear Regulatory Agency, and other sponsors. Managed a research portfolio with greater than $3 million per year in total funding. Established new research portfolios in modeling and simulation for advanced manufacturing processes and the reliability of monolithic ceramics and ceramic matrix composites. Recognized as a national expert in high temperature design.
2016-	**Principal Mechanical Engineer**, *Argonne National Laboratory* Research topics: High temperature structural materials, design of high temperature nuclear reactors and concentrating solar power systems, crystal plasticity, machine learning methods for materials and material constitutive modeling, qualification of AM nuclear components Led work on the revision and improvement of several parts of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, Division 5 covering the design and construction of high temperature nuclear reactors
2014-2016	**Postdoctoral Researcher**, *Lawrence Livermore National Laboratory* Supervisor: Nathan Barton Research topics: Multiscale material modeling of additively manufactured structured materials, modeling and optimization of lattice-structured meta-materials, multiscale modeling of HCP metals
2010-2014	**Research Assistant**, *University of Illinois at Urbana-Champaign* Supervisor: Robert Dodds, Jr.

Research topics: Parallel performance of WARP3D, crystal plasticity, mesoscale modeling of fatigue/fracture processes, homogenization and multiscale damage calculations

Honors/Awards

2023	Doug Scarth Early Career Leadership Award for Outstanding Service to the Pressure Vessels & Piping (PVP) Division as an Early Career Engineer
2022	Secretary of Energy Achievement Award
2022,2023	ASME Boiler & Pressure Vessel Code Certificate of Acclamation
2020	Impact Argonne Award for Innovation
2012-14	National Defense Science & Engineering Graduate Fellowship
2010-11	University Fellowship
2008-	Tau Beta Pi

Professional Affiliations

2016-	ASME
2016-	ANS
2014-2016	APS
2006-	ASCE, EMI

Professional Service

2018-	Generation IV Forum: Task Group/Working Group on Advanced Manufacturing and Materials Engineering *co-chair*
2020-	ASME Boiler & Pressure Vessel Code *committee chair*: BPV III WG on Analysis Methods
2018-2020	ASME Boiler & Pressure Vessel Code *committee chair*: BPV III SWG on Inelastic Analysis Methods
2017-	ASME Boiler & Pressure Vessel Code *committee member*: BPV III SG High Temperature Reactors, WG on Analysis Methods, WG High Temperature Flaw Evaluation, WG Creep-Fatigue and Negligible Creep; BPTCS/BNCS Special Committee on Use of Additive Manufacturing for Pressure Retaining Equipment, BVP I/VIII WG on Elevated Temperature Design, and several other committees.
2017-	PVP Conference: Technical Program Representative, co-Technical Program Representative, Honors and Awards Chair, Materials and Fabrication Secretary and Vice Chair, track co-chair
2018-2019	WCCM/USNCCM: *track organizer*
2023	*Reviewer for (past year)*: Materials Chemistry and Physics International Journal of Solids and Structures Computer Methods in Applied Mechanics and Engineering Engineering Fracture Mechanics International Journal of Fracture Advanced Engineering Materials International Journal of Fatigue Journal of Dynamic Behavior of Materials PVP Conference Proceedings
2018-	External proposal reviewer for DOE:NE, DOE:EERE, DOE:FES, and the NSF.

Institutional and Community Service

2019-	Library User Committee member
2015-	Volunteer at middle school/high school DOE Science Bowl
2020-	STEM chat volunteer for local elementary and high schools
2017-2018, 2021-2023	Undergraduate and graduate student summer research program mentor
2013-2014	Qualification exam review course, course organizer

PhD Committee Service

2018-2021	Alon Katz (Georgia Institute of Technology)
2022-	Janzen Choi (University of New South Wales)
2024-	Jessie Weng May Lum (University of New South Wales)

DOE:NE Work Packages Managed

2021-	ART: Several work packages – $700k/year
2019-	NEAMS: Structural Materials – $400k/year
2022-	AMMT: Several work packages – $500k/year
2020-2021	NDMQi: High Temperature Qualification – $200k/year

Funding Awards as PI

2024-2027	DOE:EERE: Validated time-dependent reliability modeling for high temperature CSP systems – $2.5M
2024-2025	DOE:AMMTO: PUMA (Powder Utilization Modeling Application): a MOOSE-based application for modeling powder post-processing for advanced manufacturing – $500k
2024-2025	US NRC: US NRC: Risk Informed Comparison of ASME Section III, Division 5 and ASME Section VIII, Divisions 1 and 2 – $100k
2024-2024	EPRI: Accelerated Qualification of 316L for ASME Section III, Division 5, Class A Construction – $80k
2023-2024	EPRI: Accelerating qualification of structural materials for advanced reactors – $80k
2023-2024	US NRC: Technical Assessment of ASME BPVC Section III, Div. 5 Composites Rules – $360k
2022-2024	Argonne Laboratory Directed Research and Development (LDRD): Microarchitected Composites – $300k
2022-2024	US NRC: Technical Assistance Pertaining to Advanced Reactors - Assessment of Salt Properties, Stress Relaxation Cracking and Materials/Component Integrity – $150k
2021-2022	DOE:HPC4Energy: An ICME Modeling Framework for Metal Matrix Composites Focusing on Ultrahigh Temperature Matrix Material with Tungsten Carbide Reinforcement – $300k
2021-2023	DOE:EERE: Design Methods, Tools, and Data for Ceramic Solar Receivers – $955k
2020-2021	DOE:EERE: High Temperature Receiver Design Package – $517k
2019-2020	US NRC: Assess State of Knowledge of Modeling and Simulation and Microstructural Analysis for Advanced Manufacturing Technologies (AMTs) – $200k
2019-2021	DOE:NE FOA: Modeling and Simulation Development Pathways to Accelerate KP-FHR Licensing (topic PI) – $500k
2018-2020	DOE:EERE Gen3 CSP: Creep-fatigue design for CSP receivers (topic PI) – $375k
2016	LLNL TechBase: Adaptive smart materials – $65k
2015	LLNL TechBase: Material model library for lattice structured meta-materials – $50k

Other Skills and Qualifications

Languages:	German (Proficient)

Publications/Presentations

Refereed journal publications

[1] Pawan Chaugule et al. "Reliability comparisons between additively manufactured and conventional SiC-Si ceramic composites". In: *Journal of the American Ceramic Society* 107.5 (2024), pp. 3117–3133.

[2] Ezra Mengiste et al. "Effect of irradiation-induced strength anisotropy on the reorientation trajectories and fragmentation behavior of grains in BCC polycrystals under tensile loading". In: *Acta Materialia* 263 (2024), p. 119503.

[3] Markian Petkov and Mark Messner. "Application of C (t)-Integral Solutions in Extending ASME BPVC Section XI Division 2 Code Case N-934 for Transient Creep Crack Growth". In: *Journal of Pressure Vessel Technology* 146.5 (2024).

[4] B. Barua et al. "Designing Cladded Components for High Temperature Nuclear Service: Part II – Design Rules". In: *Journal of Pressure Vessel Technology* 145.2 (2023), p. 021302.

[5] Bipul Barua and Mark C. Messner. "Structural Design Challenges and Implications for High Temperature Concentrating Solar Power Receivers". In: *Solar Energy* 251 (2023), pp. 119–133.

[6] Amirfarzad Behnam et al. "Uncertainty Quantification Framework for Predicting Material Response with Large Number of Parameters: Application to Creep Prediction in Ferritic-Martensitic Steels using Combined Crystal Plasticity and Grain Boundary Models". In: *Integrating Materials and Manufacturing Innovation* 11 (2023), pp. 516–531.

[7] Tianju Chen and Mark C. Messner. "Training material models using gradient descent algorithms". In: *International Journal of Plasticity* 165 (2023), p. 103605.

[8] Tianchen Hu et al. "A Three-Dimensional, Thermodynamically and Variationally Consistent, Fully Coupled, Electro-Chemo-Thermo-Mechanical Model of Solid-State Batteries". In: *Journal of The Electrochemical Society* 170.12 (2023), p. 123501.

[9] M. C. Messner et al. "Designing Cladded Components for High Temperature Nuclear Service: Part I – Analysis Methods". In: *Journal of Pressure Vessel Technology* 145.2 (2023), p. 021301.

[10] Mark Messner, Guosheng Ye, and T.-L. Sham. "A Structural Design Approach Tailored for the Rapid, Preliminary Design of Microreactor Components". In: *Nuclear Technology* 209.sup1 (2023), S60–S72.

[11] Mark C Messner, Tianchen Hu, and Tianju Chen. "Time-vectorized numerical integration for systems of ODEs". In: *arXiv preprint arXiv:2310.08649* (2023).

[12] Holly D. Carlton et al. "Incorporating defects into model predictions of metal lattice-structured materials". In: *Materials Science and Engineering: A* 832 (2022), p. 142427.

[13] A. M. Katz, Davesh Ranjan, and M. C. Messner. "A Novel Approach for Bounding the Stress Experienced by the Core of Utility-Scale Printed Circuit Heat Exchangers Under Thermohydraulic Loads". In: *Journal of Pressure Vessel Technology* 144.4 (2022).

[14] Aritra Chakraborty and Mark C. Messner. "Bayesian analysis for estimating statistical parameter distributions of elasto-viscoplastic material models". In: *Probabilistic Engineering Mechanics* 66 (2021), p. 103153.

[15] Aritra Chakraborty, Mark C. Messner, and T.-L. Sham. "A minimum creep rate for 2-1/4Cr-1Mo steel consistent with the ASME Section III, Division 5 rules". In: *Journal of Pressure Vessel Technology* 134.4 (2021), p. 044502.

[16] A. M. Katz, M. Messner, and Davesh Ranjan. "A novel approach for bounding the stress experienced by the core of utility-scale printed circuit heat exchangers under thermohydraulic loads". In: *Journal of Pressure Vessel Technology* (2021).

[17] Andrea Nicolas, Mark Messner, and T.-L. Sham. "A method for predicting failure statistics for steady state elevated temperature components". In: *International Journal of Pressure Vessels and Piping* 192 (2021), p. 104363.

[18] Andrea Rovinelli et al. "Accurate effective stress measures: Predicting creep life for 3D stresses using 2D and 1D creep rupture simulations and data". In: *Integrating Materials and Manufacturing Innovation* (2021).

[19] M. C. Messner. "Convolutional neural network surrogate models for the mechanical properties of periodic structures". In: *Journal of Mechanical Design* 142.2 (2020).

[20] Dileep Singh et al. “One piece ceramic heat exchanger for concentrating solar power electric plants”. In: *Renewable Energy* 160 (2020), pp. 1308–1315.

[21] M. C. Messner, V.-T. Phan, and T.-L. Sham. “Evaluating and modeling rate sensitivity in advanced reactor structural materials: 316H, Gr. 91, and A617”. In: *International Journal of Pressure Vessels and Piping* 178 (2019), p. 103997.

[22] M. C. Messner et al. “A Method for Including Diffusive Effects in Texture Evolution”. In: *Journal of the Mechanics and Physics of Solids* 125 (2019), pp. 785–804.

[23] M. C. Messner et al. “Combined Crystal Plasticity and Grain Boundary Modeling of Creep in Ferritic-Martensitic Steels, Part 2: The Effect of Stress and Temperature on Engineering and Microstructural Properties”. In: *Modelling and Simulation in Materials Science and Engineering* 27.7 (2019), p. 075010.

[24] Omar Nassif et al. “Combined Crystal Plasticity and Grain Boundary Modeling of Creep in Ferritic-Martensitic Steels, Part 1: Theory and Implementation”. In: *Modelling and Simulation in Materials Science and Engineering* 27.7 (2019), p. 075009.

[25] Julie A Jackson et al. “Field responsive mechanical metamaterials”. In: *Science Advances* 4.12 (2018), eaau6419.

[26] H. D. Carlton et al. “Mapping local deformation behavior in single cell metal lattice structures”. In: *Acta Materilia* 129 (2017), pp. 239–250.

[27] M. C. Messner et al. “A crystal plasticity model for slip resistance and junction formation in HCP metals”. In: *Modelling and Simulation in Materials Science and Engineering* 25.4 (2017), p. 044001.

[28] Mark C Messner. “A fast, efficient direct slicing method for slender member structures”. In: *Additive Manufacturing* 18 (2017), pp. 213–220.

[29] J. A. Hawreliak et al. “Dynamic Behavior of Engineered Lattice Materials”. In: *Scientific Reports* 6 (2016).

[30] M. C. Messner. “Optimal lattice-structured materials”. In: *Journal of the Mechanics and Physics of Solids* 96 (2016), pp. 162–183.

[31] M. C. Messner, A. J. Beaudoin, and R. H. Dodds, Jr. “A grain boundary damage model for delamination”. In: *Computational Mechanics* 56 (2015), pp. 1–20.

[32] M. C. Messner, R. H. Dodds, Jr., and A. J. Beaudoin. “Consistent crystal plasticity kinematics and linearization for the implicit finite element method”. In: *Engineering Computations* 32.6 (2015), pp. 1526–1548.

[33] M. C. Messner et al. “Wave propagation in equivalent continuums representing truss lattice materials”. In: *International Journal of Solids and Structures* 73-74 (2015), pp. 55–66.

[34] M.C. Messner, A. J. Beaudoin, and R. H. Dodds, Jr. “An interface compatibility/equilibrium mechanism for delamination fracture in aluminum-lithium alloys”. In: *Engineering Fracture Mechanics* 133 (2015), pp. 70–84.

[35] M.C. Messner, A. J. Beaudoin, and R. H. Dodds, Jr. “Mesoscopic modeling of crack arrestor delamination in Al-Li: Primary crack shielding and T-stress effect”. In: *International Journal of Fracture* 188.2 (2014), pp. 229–249.

Pending refereed journal publications

[36] Chaofan Huang et al. “Calibration of RAMF Micro Mechanical Model for Creep using Bayesian Optimization for Functional Output”. In: *Submitted for publication* (2024).

[37] Tianju Chen and Mark C. Messner. “Uncertainty Quantification of Visco-Plastic Constitutive Model Parameters using a Hierarchical Bayesian Framework”. In: *Submitted for publication* (2023).

[38] Hao Deng and Mark C. Messner. “Data-Driven Method for Modeling Creep-Fatigue Stress- Strain Behavior Using Neural ODEs”. In: *Submitted for publication* (2023).

[39] Tianchen Hu and Mark C. Messner. “A Simple, Scalable Large Deformation Solid Mechanics Implementation in the MOOSE Framework”. In: *Submitted for publication* (2023).

Refereed conference publications

[40] Sagar Bhatt et al. "Microstructural Models for the Creep Strength and Ductility of Diffusion-Bonded 316H Steel". In: *10th International Conference on Advances in Materials, Manufacturing and Repair for Power Plants*. 2024.

[41] M. C. Messner. "A Standard Form for Cyclic Plasticity Models Used with the ASME Section III, Division 5 Rules". In: *ASME 2024 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2024.

[42] Bipul Barua and Mark C Messner. "A Comprehensive Sample Problem for Section III Division 5 Design by Elastic Analysis". In: *ASME 2023 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2023.

[43] Bipul Barua et al. "Design Data for Alloy 740H High Temperature Concentrating Solar Power Components". In: *ASME 2023 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2023.

[44] Bipul Barua et al. "Time-dependent Failure Assessment of Ceramic Receivers". In: *29th SolarPACES Conference,* SolarPACES. 2023.

[45] Tianju Chen and Mark C. Messner. "A Universal Inelastic Constitutive Model for High Temperature Deformation." In: *ASME 2023 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2023.

[46] Tianchen Hu and Mark C. Messner. "What Best Correlates to High Temperature Failure: Strain, Stress, Dissipation, or Something Else?" In: *ASME 2023 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2023.

[47] Bipul Barua, Mark C. Messner, and T.-L. Sham. "Design Charts for an Integrated Creep-fatigue Damage Evaluation Approach". In: *ASME 2022 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2022.

[48] Bipul Barua, Mark C. Messner, and T.-L. Sham. "Nickel Cladded Structural Components for Advanced Reactors". In: *ASME 2022 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2022.

[49] F. C. Brust, J. Sallaberry, and M. C. Messner. "High Temperature Flaw Evaluation Code Case: Technical Basis and Examples". In: *ASME 2022 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2022.

[50] Pawan Chaugule et al. "Investigating Various Failure Models on Commercial SiC". In: *28th SolarPACES Conference*. 2022.

[51] Mark Messner et al. "A Computer Design Tool for Ceramic Receivers". In: *28th SolarPACES Conference*. 2022.

[52] Mark C. Messner. "A Viscoplastic Model for Alloy 800H for use with the Section III, Division 5 Design by Inelastic Analysis Methods for Class A Components". In: *ASME 2022 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2022.

[53] B. Barua, R. I. Jetter, and T.-L. Sham. "Simplified Criteria with Reduced Testing Effort for Selecting Clad Materials for High Temperature Reactor Structural Components". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[54] Bipul Barua and Mark Messner. "Fast Heuristics for Receiver Life Estimation and Design". In: *27th SolarPACES Conference*. 2021.

[55] David Dewees et al. "Comparison of candidate steady loading elevated temperature design-by-analysis methods". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[56] Michael McMurtrey and M. Messner. "Qualification Challenges for Additive Manufacturing in High Temperature Nuclear Applications". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[57] M. C. Messner and T.-L. Sham. "A Viscoplastic Model for Alloy 617 for use with the ASME Section III, Division 5 Design by Inelastic Analysis Rules". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[58] Andrea Nicolas, Mark Messner, and T.-L. Sham. "A Probabilistic Margin Assessment of the ASME Section III, Division 5 Primary Load Design Rules for Class A Components". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[59] Andrea Rovinelli, Mark Messner, and T.-L. Sham. "A Comprehensive Comparison between Different Multiaxial Cycle Counting Procedures". In: *ASME 2021 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2021.

[60] B. Barua et al. "Acceptance Criteria for the Mechanical Integrity of Clad/Base Metal Interface for High Temperature Nuclear Reactor Cladded Components". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[61] B. Barua et al. "Development of Design Method for High Temperature Nuclear Reactor Cladded Component". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[62] B. Barua et al. "Selection Criteria for Clad Materials to Use with a 316H Base Material for High Temperature Nuclear Reactor Cladded Components". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[63] Bipul Barua, Mark Messner, and Dileep Singh. "Assessment of Ti3SiC2 MAX Phase as a Structural Material for High Temperature Receivers". In: *26th SolarPACES Conference*. 2020.

[64] Aritra Chakraborty, M. C. Messner, and T.-L. Sham. "Uncertainty quantification of viscoplastic parameters for Grade 91 steel through Bayesian analysis". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[65] M. C. Messner, R.I. Jetter, and T.-L. Sham. "A High Temperature Primary Load Design Method Based on Elastic Perfect-Plasticity and Simplified Inelastic Analysis". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[66] Mark Messner and Bipul Barua. "A Fast Tool for Receiver Life Estimation and Design". In: *26th SolarPACES Conference*. 2020.

[67] Mark Messner, Bipul Barua, and Dileep Singh. "Towards a Design Framework for Nonmetallic Concentrating Solar Power Components". In: *26th SolarPACES Conference*. 2020.

[68] A. Rovinelli, M. C. Messner, and T.-L. Sham. "Investigating the Correlation Between Different Effective Stress Measures and the Service Life of Actual High Temperature Structural Components". In: *ASME 2020 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2020.

[69] B. Barua, M. C. Messner, and M. McMurtrey. "Comparison and Assessment of the Creep-fatigue Design Methods for a Reference Gen3 Molten Salt Concentrated Solar Power Receiver". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[70] B. Barua et al. "Design Methodologies for High Temperature Reactor Structural Components Cladded with Noncompliant Materials". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[71] M. C. Messner, R. I. Jetter, and T.-L. Sham. "A Method for Directly Assessing Elastic Follow up in 3D Finite Element Calculations". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[72] M. C. Messner and T.-L. Sham. "Isochronous Stress-Strain Curves for Alloy 617". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[73] V.-T. Phan, M. C. Messner, and T.-L. Sham. "A Unified Engineering Inelastic Model for 316H Stainless Steel". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[74] Y. Wang et al. "Development of Simplified Model Test Methods for Creep Fatigue Interaction". In: *ASME 2019 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2019.

[75] M. C. Messner, R. I. Jetter, and T.-L. Sham. "Establishing Temperature Upper Limits for the ASME Section III, Division 5 Design by Elastic Analysis Methods". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[76] M. C. Messner, V.-T. Phan, and T.-L. Sham. "A Unified Inelastic Constitutive Model for the Average Engineering Response of Grade 91 Steel". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[77] M. C. Messner and T.-L. Sham. "Detection of Ratcheting in Finite Element Calculations". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[78] M. C. Messner, T.-L. Sham, and Yanli Wang. "N-bar Problems as Approximations to the Bree Problem". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[79] M. C. Messner et al. "A Basis for Applying Elastic Perfectly-Plastic Design Methods to Cyclic Softening Materials". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[80] M. C. Messner et al. "Assessment of Passively Actuated In-Situ Cyclic Surveillance Test Specimens for Advanced Non-Light Water Reactors". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[81] M. C. Messner et al. "The Mechanical Interaction of Clad and Base Metal for Molten Salt Reactor Structural Components". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[82] M. C. Messner et al. "The Role of Material Modeling on Strain Range Evaluation for Elevated Temperature Cyclic Life Evaluation". In: *ASME 2018 Pressure Vessels and Piping Conference*. American Society of Mechanical Engineers. 2018.

[83] M. C. Messner, T.-L. Sham, and R. I. Jetter. "Verification of the EPP code case for strain limits evaluations by inelastic analysis method". In: *Proceedings of the ASME 2017 Pressure Vessels and Piping Conference*. Vol. PVP2017-65418. 2017, pp. 1–10.

[84] M. C. Messner et al. "Modeling shocks in periodic lattice materials". In: *AIP Conference Proceedings*. 1793. 2017, p. 080012.

[85] Y. Wang et al. "Combined load and displacement controlled testing to support development of simplified component design rules for elevated temperature service". In: *Proceedings of the ASME 2017 Pressure Vessels and Piping Conference*. PVP2017-65455. 2017, pp. 1–6.

Patents

[86] Julie A Jackson et al. "Systems and methods for additive manufacturing to encapsulate transformative colloidal suspensions". 10,661,549 (United States). 2020.

[87] Mark Christian Messner. "A fast, efficient direct slicing method for lattice structures". 10,723,079 (United States). 2020.

Non-refereed publications

[88] Bipiul Barua and Mark C. Messner. *Engineering Calculations and Analysis of the Core Barrel and Downcomer Piping in the MARVEL PCS*. Tech. rep. ANL-24/36. Argonne National Laboratory, 2024.

[89] Bipul Barua and Mark C. Messner. *ASME Section III, Division 5, Class A 100,000-hour design data for Alloy 709*. Tech. rep. ANL-ART-285. Argonne National Laboratory, 2024.

[90] Shahmeer Baweja, Tianchen Hu, and Mark Messner. *Predicting long-term stress relaxation on Alloy 709 using the crystal plasticity finite element method*. Tech. rep. ANL-24/33. Argonne National Laboratory, 2024.

[91] Sagar Bhatt et al. *Simulating the effect of grain structure and porosity on creep for powder bed fusion 316H*. Tech. rep. ANL-AMMT-016. Argonne National Laboratory, 2024.

[92] Pawan Chaugule et al. *Design Methods, Tools, and Data for Ceramic Solar Receivers*. Tech. rep. ANL-24/51. Argonne National Laboratory, 2024.

[93] Tianchen Hu and Mark C. Messner. *Simplified inelastic constitutive models for ASME Section III, Division 5 design by inelastic analysis*. Tech. rep. ANL-ART-284. Argonne National Laboratory, 2024.

[94] Tianchen Hu et al. *NEML2: A High Performance Library for Constitutive Modeling*. Tech. rep. ANL-24/43. Argonne National Laboratory, 2024.

[95] Mark C. Messner, Bipul Barua, and Gouosheng Ye. *Acceptance criteria for in situ surveillance of MSR materials based on thermally-loaded mechanical test articles*. Tech. rep. ANL-ART-287. Argonne National Laboratory, 2024.

[96] Mark C. Messner and Abhishek Bhesania. *Initial Alloy 709 constitutive models for use with the ASME design by inelastic analysis and EPP+SMT design methods*. Tech. rep. ANL-ART-286. Argonne National Laboratory, 2024.

[97] Mark C. Messner et al. *Updated ASME design correlations and qualification plan for powder bed fusion 316H stainless steel*. Tech. rep. ANL-AMMT-015. Argonne National Laboratory, 2024.

[98] Tianju Chen and Mark C. Messner. *High temperature inelastic constitutive models for the ASME Section III, Division 5 Class A materials*. Tech. rep. ANL-ART-269. Argonne National Laboratory, Sept. 2023.

[99] Tianju Chen et al. *An ICME Modeling Framework for Titanium/Tungsten-Carbide Metal Matrix Composites*. Tech. rep. ANL-23/32. Argonne National Laboratory, May 2023.

[100] Tianju Chen et al. *Preliminary prediction of long-term aging and creep behavior of AM 316 SS*. Tech. rep. ANL-AMMT-011. Argonne National Laboratory, Sept. 2023.

[101] Tianchen Hu and Mark C. Messner. *A mechanistic model for creep and thermal aging in Alloy 709*. Tech. rep. ANL-23/43. Argonne National Laboratory, Sept. 2023.

[102] Tianchen Hu and Mark C. Messner. *NEML2: Efficient, vectorized material modeling*. Tech. rep. ANL-23/44. Argonne National Laboratory, Sept. 2023.

[103] Mark C. Messner. *Modeling support for the development of material surveillance specimens and procedures*. Tech. rep. ANL-ART-268. Argonne National Laboratory, Sept. 2023.

[104] Mark C. Messner and Tianju Chen. *Statistical Viscoplastic Model for 316H Steel*. Tech. rep. ANL-23/05. Argonne National Laboratory, Jan. 2023.

[105] Mark C. Messner et al. *ASME Code Qualification Plan for LPBF 316 SS*. Tech. rep. ANL-AMMT-009. Argonne National Laboratory, Sept. 2023.

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