

Purdue University, School of Materials Engineering  
701 West Stadium Ave, West Lafayette, IN 47907-2045, USA

Phone: +1 (765) 494-9215  
E-mail: [titus9@purdue.edu](mailto:titus9@purdue.edu)

## Research Interests

High temperature structural materials, creep deformation mechanisms, rapid alloy design and development, defect and microstructural analysis by advanced electron microscopy, first-principles modeling of crystalline defects in metals, thermodynamic modeling of oxidation in refractory-based alloys, integrated computational materials design of structural alloys

## Education

Ph.D. Materials

Materials Department, University of California Santa Barbara  
Santa Barbara, CA; Graduation date: June 2015

B.S. Engineering Physics

Department of Physics, The Ohio State University,  
Columbus, OH; Graduation date: June 2010

## Employment and Positions

**Jul 2023–Present** School of Materials Engineering, Purdue University  
Position: Associate Professor

**Dec 2023–Present** IMDEA Materials, Madrid, Spain  
Position: Visiting Professor. Host: Prof. Javier Llorca

**Dec 2016–Jul 2023** School of Materials Engineering, Purdue University  
Position: Assistant Professor

**Sep 2015–Dec 2016** Max Planck Institute for Iron Research, Dusseldorf, Germany  
Position: Alexandor von Humboldt Postdoctoral Research Fellow  
Sponsor: Prof. Dr. Dierk Raabe

**Jul 2015–Sep 2015** Materials Department, University of California, Santa Barbara  
Position: Postdoctoral Researcher

**Jul 2010–Jun 2015** Materials Department, University of California, Santa Barbara  
Position: Graduate Student Researcher, Ph.D. Candidate  
Advisor: Prof. Tresa M. Pollock

**Jun 2009–Sept 2009** GE Aviation, Cincinnati, OH  
Position: Airfoils Materials Application Engineering Intern

**Jun 2008–Sept 2008** GE Aviation, Cincinnati, OH  
Position: Materials Behavior Intern

## Awards and Recognitions

**2021** ASM Bradley Stoughton Award for Young Teachers

**2020** TMS Young Leaders International Scholar - JIM

**2019** Outstanding Mentor of Engineering Graduate Students, College of Engineering, Purdue University

**2019** NSF CAREER Award

**2018** Acta Materialia Outstanding Reviewer Award

**2018** TMS SMD Young Leaders Professional Development Award

- 2017** Acta Materialia Outstanding Reviewer Award
- 2015** Alexander von Humboldt Fellowship for Postdoctoral Researchers
- 2014** Runner-up, Best Platform Presentation, SCSMM 2014 Symposium
- 2013** Los Angeles Chapter of ASM International Scholarship
- 2012** Best Presentation Award, ACEEES 2012
- 2012** International Symposium on Superalloys Scholarship

## Professional Activities

- 2022-2025** TMS Board of Directors
- 2022-2025** TMS P&GA Committee Chair
- 2021** TMS 2021, AI/Data informatics: Tools for Accel. Design of High-temperature Alloys, Lead Organizer
- 2021** TMS 2021, Materials for High Temp. Applications: Next Gen. Superalloys and Beyond, Co-Organizer
- 2020-2021** TMS Study of High Entropy Alloys, Lead Team Member
- 2020-2023** TMS P&GA Committee Vice Chair
- 2020** TMS 2020, Materials Design Approaches and Advances V, Co-Organizer
- 2020** 2<sup>nd</sup> Annual ASM Indianapolis Chapter Conf.: Metallic Alloys: Past, Present, and Future, Co-Organizer
- 2019-Present** Metallurgical and Materials Transactions A, Key Reader
- 2019** TMS 2019, Deformation Behavior of High Temperature Alloys, Lead Organizer
- 2019** TMS 2019, Gamma (FCC)/Gamma-Prime (L12) Co-Based Superalloys III, Lead Organizer
- 2018** Summer Faculty Fellow, Air Force Research Laboratories, Dayton, OH
- 2018** 6th International workshop on Co-base Superalloys, 2018, Co-Organizer
- 2018-Present** TMS P&GA Committee SMD representative
- 2018-Present** TMS SMD Council Member
- 2018** TMS 2018, Deformation and Damage Mechanisms in High-Temperature Ni, Co and Fe-based Superalloys, Co-Organizer
- 2017** TMS 2017, Gamma (FCC)/Gamma-Prime (L12) Co-Based Superalloys II symposium, Co-Organizer
- 2017-2019** TMS Young Professional Committee, Member
- 2017** NSF “Advancing and Accelerating Materials Innovation Through the Synergistic Interaction among Computation, Experiment, and Theory: Opening New Frontiers: Multicomponent Materials and Additive Manufacturing,” Workshop Participant
- 2015-Present** TMS High Temperature Alloys Committee, Member
- 2014** Materials Advantage Congressional Visit Days, Washington, D.C.
- 2014** Purdue Prospective Faculty Workshop, Purdue University, West Lafayette, IN

## Service and Outreach

- 2023** TMS Bladesmithing Competition, Faculty Advisor
- 2023** FIERF Forging Competition, Faculty Advisor
- 2023** SFSA Cast in Steel, Faculty Advisor
- 2022** Purdue University / Rensselaer Polytechnic Institute Material Advantage Collaboration, Speaker
- 2021** SFSA Cast in Steel, Faculty Advisor
- 2021** Engineering Academic Career Club, Summer Faculty Mentor
- 2021** Engineering Academic Career Club, Presentation and Panel Discussion entitled “Unraveling the mysteries of faculty applications (in USA) Pt. I”, presenter and panel moderator
- 2020** Klondike Elementary Carnival - Cast and gave out pewter medallions to students
- 2019-Present** Purdue University Material Advantage Faculty Advisor
- 2019** Gordon Research Seminar, Physical Metallurgy, Faculty Mentor
- 2019** Engineering Academic Career Club, Summer Faculty Mentor
- 2019** Engineering Academic Career Club, Presentation and Panel Discussion entitled “Unraveling the mysteries of faculty applications (in USA)”, presenter and panel moderator
- 2018-2020** ASM Teacher’s Camp, College Q&A Presenter, Cincinnati, OH
- 2018** SFSA Cast in Steel, Faculty Advisor
- 2017** TMS 2017 Meet-A-Mentor, Mentor

## Publications

Submitted and Prepared Manuscripts (available upon request)

45. C.-C. Chen, S. Tripathi, S. Yao, A. Strachan, and M.S. Titus, “Control of martensitic transformation temperatures through Heusler phase precipitation in a NiTiHf-based shape memory alloy.” In Preparation.
44. T. Mann, M.G. Fahrman, M. Koslowski, and M.S. Titus, “Phase Field Dislocation Dynamics Modeling of Shearing Modes in Ni<sub>2</sub>(Cr,Mo,W)-containing HAYNES® 244® Superalloy” In Preparation.
43. D. Wen, V. Tucker, and M.S. Titus “Bayesian Optimization Acquisition Functions for Accelerated Search of Energy Convex Hull of Multi-Component Alloys.” Under Review.
42. V. Tucker, D. Wen, and M.S. Titus “Predicting and Measuring Segregation Enthalpy of Suzuki Segregation in Binary Co-Ni alloy.” Under Review.
41. T. Mann, M.S. Titus, and M.F. Fahrman “Deformation Influenced Microstructural Evolution of High Temperature Alloys.” Under Review.
40. T. Mann, V. Tucker, M. Fahrman, P. Kenesei, J.-S. Park, and M.S. Titus “Formation of the  $\gamma'''$ -Ni<sub>2</sub>(Cr,Mo,W) phase during two-step heat treatment in HAYNES® 244® Alloy.” Under Review.
39. J.G. Mendez, W.J. Heffern, S.D. Hagaman, M.F. Troper, A.D. Dicus, M.E Epler, M.J.M. Krane, M.S. Titus, and S.A.J. Forsik “Modeling Microstructural Development During Hot Working of Ni-Based Superalloy CarTech 680.” Under Review.

Refereed Journal Articles

38. S. Mishra, S. Karumuri, V. Mika, C. Scott, C. Choy, K.H. Sandhage, I. Bilonis, M.S. Titus, and A. Strachan, “Mass uptake during oxidation of metallic alloys: literature data collection, analysis, and FAIR sharing,” *Computational Materials Science* **233** 112671 (2024). [\[doi\]](#)
37. D. Wen and **M.S. Titus**, “Electronic Origin of Suzuki Segregation of Transition Metal Elements in Face-Centered Cubic Co and Ni Alloys,” *Computational Materials Science*. **220** 112033 (2023). [\[doi\]](#)
36. D.E. Farache\*, G.M. Nishibuchi\*, S. Elizondo, J.G. Gulley, A. Post, K. Stubbs, K. Kruger, A. Mannodi-Kanakkithodi, and **M.S. Titus**, “Linking stress rupture properties to processing parameters of HAYNES® 718 nickel superalloy via machine learning.” in: E.A. Ott, et al., eds., *Proceedings of the 10th International Symposium on Superalloy 718 and Derivatives*, The Minerals, Metals and Materials Society, Warrendale, PA, USA. 383-398 (2023). [\[doi\]](#)
35. T. Mann, M.F. Fahrman, **M.S. Titus**, “Deformation-induced Planar Defects in Immm Ni<sub>2</sub>(Cr, Mo, W) containing HAYNES® 244®,” *Metallurgical and Materials Transactions A* **54** 1874-1885 (2023). Editor’s Choice Award, Jan 2023. [\[doi\]](#)
34. D. Wen and **M.S. Titus**, “pySSpredict: A Python-based Solid-Solution Strength Prediction Toolkit for Complex Concentrated Alloys,” *Computational Materials Science*, **220** 111977 (2023). [\[doi\]](#)
33. S. Karumuri, Z. McClure, A. Strachan, **M.S. Titus**, and Ilias Bilonis, “Hierarchical Bayesian Approach to Experimental Data Fusion: Application to Strength Prediction of High Entropy Alloys from Hardness Measurements,” *Computational Materials Science*, **217** 111851 (2023). [\[doi\]](#)
32. T. Mann, M.F. Fahrman, **M.S. Titus**, “Ab-initio investigation of planar defects in Immm-Ni<sub>2</sub>(Cr,Mo,W)-containing Haynes® 244® Superalloy,” *Metallurgical and Materials Transactions A* **53** 4188-4206 (2022). [\[doi\]](#)
31. S. Tripathi, K.G. Vishnu, **M.S. Titus**, and A. Strachan, “Uncovering the role of nanoscale precipitates on martensitic transformation and superelasticity,” *Acta Materialia* **229** 117790 (2022). [\[doi\]](#)

30. S. Tripathi, **M.S. Titus**, and A. Strachan, “Martensite Transformation in Superlattices of Two Non-Transforming Metals,” *Journal of Applied Physics* **130** 165105 (2021). [doi]
29. T.M. Butler, O.N. Senkov, T.I. Daboiku, M.A. Velez, H.E. Schroader, L.G. Ware, and **M.S. Titus**, “Oxidation behaviors of CrNb, CrNbTi, and CrNbTaTi Concentrated Refractory Alloys,” *Intermetallics* **140** 107374 (2022). [doi]
28. D. Wen and **M.S. Titus**, “First-principles study of Suzuki segregation at stacking faults in disordered face-centered cubic Co-Ni alloys,” *Acta Materialia* **221** 117358 (2021). [doi]
27. T. Daboiku, T.M. Butler, O.N. Senkov, S. Kuhr, L.G. Ware, **M.S. Titus**, and N.R. Philips, Title Redacted, *Journal of Propulsion and Energetics (JANNAF)* (2021).
26. S. Tripathi, L.-C. Fan, **M.S. Titus**, and A. Strachan, “Automated approach to discover coherent precipitates in multi-component shape memory alloys,” *Computational Materials Science* **197** 110651 (2021). [doi]
25. B. Bellón, A.K. Boukellal, T. Isensee, O.M. Wellborn, K.P. Trumble, M.J.M. Krane, **M.S. Titus**, D. Tournet, J. Llorca, “Multiscale prediction of microstructure length scales in metallic alloy casting,” *Acta Materialia* **207** 116686 (2021). [doi]
24. O.N. Senkov, T.I. Daboiku, T.M. Butler, **M.S. Titus**, N.R. Philips, and E.J. Payton, “High-Temperature Mechanical Properties and Oxidation Behavior of Hf-27Ta and Hf-21Ta-21X (X is Nb, Mo or W) Alloys,” *International Journal of Refractory Metals and Hard Materials* **96** 105467 (2021). [doi]
23. K. Wertz, D. Weaver, D. Wen, **M.S. Titus**, R. Shivpuri, S. Niezgodá, M. Mills, and S.L. Semiatin, “Supersolvus hot workability and dynamic recrystallization in wrought Co-Al-W base alloys,” in: S. Tin et al. (eds) *Superalloys 2020*. The Minerals, Metals and Materials Society, Warrendale, PA, USA, pp. 857–869 (2020). [doi]
22. S. Tripathi, K.G. Vishnu, **M.S. Titus**, and A. Strachan, “Tunability of martensitic transformation in Mg-Sc shape memory alloys: a DFT study,” *Acta Materialia* **189**, 1–9 (2020). [doi]
21. S. Matsunaga, D. Huang, S.B. Inman, J.C. Mason, D. Konitzer, D.R. Johnson, and **M.S. Titus**, “Planar front growth of single crystal Ni-based superalloy René N515,” *JOM*, March (2020). [doi]
20. D. Wen, C.-H. Chang, S. Matsunaga, G. Park, L. Ecker, S.K. Gill, M. Topsakal, M.A. Okuniewski, S. Antonov, D.R. Johnson, and **M.S. Titus**, “Structure and Tensile Properties of  $M_x(\text{MnFeCoNi})_{1.00-x}$  Solid Solution Strengthened High Entropy Alloys.” *Materialia*, 100539 (2020). [doi]
19. S. Liu, S.N. Reed, M.J. Higgins, **M.S. Titus**, and R. Kramer-Bottiglio, “Oxide rupture-induced conductivity in liquid metal nanoparticles by laser and thermal sintering,” *Nanoscale* **11**, 17615–17629 (2019). [doi]
18. L. Feng, D. Lv, R.K. Rhein, J.G. Goiri, **M.S. Titus**, A. Van der Ven, T.M. Pollock, and Y. Wang, “Shearing of  $\gamma'$  particles in Co-base and Co-Ni-base superalloys,” *Acta Materialia* **161**, 99–109 (2018). [doi]
17. R.K. Rhein, P.G. Callahan, S.P. Murray, J.-C. Stinville, **M.S. Titus**, A. Van der Ven, and T.M. Pollock, “Creep behavior of quinary  $\gamma'$ -strengthened Co-base superalloys,” *Metallurgical and Materials Transactions A* **49A**, 4090–4098 (2018). [doi]
16. C.-H. Chang, **M.S. Titus**, and J.-W. Yeh, “Oxidation behavior between 700 and 1300 °C of refractory TiZrNbHfTa high-entropy alloys containing aluminum,” *Advanced Engineering Materials* **1700948** (2018). [doi]
15. P.G. Callahan, J.-C. Stinville, E. Yao, M. Echlin, **M.S. Titus**, S. Daly, D.S. Gianola, M. De Graef, and T.M. Pollock, “Scanning transmission electron microscopy using a conventional scanning electron microscope: defect observations and image simulations,” *Ultramicroscopy* **186**, 49–61 (2018). [doi]

14. **M.S. Titus**, R.K. Rhein, P.B. Wells, P.C. Dodge, G.B. Viswanathan, M.J. Mills, A. Van der Ven, and T.M. Pollock, “Solute segregation and deviation from bulk thermodynamics at nanoscale crystalline defects,” *Science Advances* **2**:e1601796, (2016). [[doi](#)]
13. M.P. Echlin, **M.S. Titus**, M. Straw, P. Gumbsch, and T.M. Pollock, “Femtosecond laser interactions with functional materials,” *Acta Materialia* **124**, 37–46 (2017). [[doi](#)]
12. **M.S. Titus**, L.H. Rettberg, and T.M. Pollock, “High temperature creep of  $\gamma'$ -containing CoNi-based superalloys.” In M.C. Hardy, et al., editors, *Superalloys 2016*, Seven Springs, PA, USA, 2012. The Minerals, Metals and Materials Society, Warrendale, PA, USA. pp. 141–148 (2016). [[doi](#)]
11. Y.M. Eggeler, J. Müller, **M.S. Titus**, A. Suzuki, T.M. Pollock, and E. Spiecker, “Planar defect formation in the  $\gamma'$  phase during high temperature creep in single crystal CoNi-base superalloys,” *Acta Materialia* **113**, 335–349 (2016). [[doi](#)]
10. R.W. Jackson, **M.S. Titus**, M.R. Begley, and T.M. Pollock, “Implications of thermal expansion mismatch for coated L1<sub>2</sub>-containing Co-based superalloys,” *Surface and Coatings Technology* **289**, 61–68 (2016). [[doi](#)]
9. R.K. Rhein, P.C. Dodge, M.-H. Chen, **M.S. Titus**, T.M. Pollock, and A. Van der Ven, “Vibrationally-induced stability of the L1<sub>2</sub> phase along the Co<sub>3</sub>Al-Co<sub>3</sub>W pseudobinary calculated using first-principles methods,” *Physical Review B* **92**, 174117 (2015). [[doi](#)]
8. **M.S. Titus**, M.P. Echlin, P. Gumbsch, and T.M. Pollock. “Dislocation Injection in Strontium Titanate by Femtosecond Laser Pulses,” *Journal of Applied Physics* **118**, 075901 (2015). [[doi](#)]
7. D.J. Jorgensen, **M.S. Titus**, and T.M. Pollock “Femtosecond laser ablation behavior of the Intermetallic NiAl,” *Applied Surface Science* **353**, 700–707 (2015). [[doi](#)]
6. **M.S. Titus**, A. Mottura, G.B. Viswanathan, M.J. Mills, and T.M. Pollock. “High Resolution Energy Dispersive Spectroscopy Mapping of Planar Defects in L1<sub>2</sub>-containing Co-base Superalloys,” *Acta Materialia* **85**, 423-437 (2015). [[doi](#)]
5. **M.S. Titus**, Y.M. Eggeler, A. Suzuki, and T.M. Pollock. “Creep-induced Planar Defects in L1<sub>2</sub>-containing Co- and CoNi-base Superalloys,” *Acta Materialia* **82**, 530-539 (2015). [[doi](#)]
4. J. Zhu, **M.S. Titus**, and T.M. Pollock. “Experimental Investigation and Thermodynamic Modeling of the Co-rich Region in the Co-Al-Ni-W Quaternary System,” *Journal of Phase Equilibria*, **35**:5, 595-611 (2014). [[doi](#)]
3. Y.M. Eggeler, **M.S. Titus**, A. Suzuki, and T.M. Pollock. “Creep Deformation-induced Antiphase Boundaries in L1<sub>2</sub>-containing Single Crystal Cobalt Base Superalloys,” *Acta Materialia* **77**, 352-359 (2014). [[doi](#)]
2. **M.S. Titus**, A. Suzuki, and T. M. Pollock. “High Temperature Creep of New L1<sub>2</sub>-containing Cobalt-base Superalloys.” In E. Huron, M. Hardy, M. Mills, R. Montero, P. Portella, J. Telesman, and R. C. Reed, editors, *Superalloys 2012*, Seven Springs, PA, USA, 2012. The Minerals, Metals and Materials Society, Warrendale, PA, USA. 823-832 (2012). [[doi](#)]
1. **M.S. Titus**, A. Suzuki, T. M. Pollock, “Creep and directional coarsening in single crystals of new  $\gamma$ - $\gamma'$  cobalt-base alloys,” *Scripta Materialia* **66**:8, 574-577 (2012). [[doi](#)]

## Patents

1. T. Pourpoint, J. Ellis, B. Smith, B. Francis, **M.S. Titus**, “Electrochemical Techniques Producing Wetting Controlling Microfeatures” US Patent Application 18/465,956. Submitted 9/13/2023.

## Invited Oral Presentations

55. M.S. Titus *Predicting deformation mechanisms in structural alloys with electronic structure calculations* École polytechnique fédérale de Lausanne, Lausanne, Switzerland (2023). Host: Prof. Anirudh Natarajan.
54. S. Karumuri, S. Mishra, A. Bejjipurapu, V. Mika, C. Scott, N. Awalgaonkar, A. Hernandez, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* MS&T, Columbus, OH (2023).
53. S. Karumuri, S. Mishra, A. Bejjipurapu, V. Mika, C. Scott, N. Awalgaonkar, A. Hernandez, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* MRS Spring Meeting, San Francisco, CA (2023).
52. S. Karumuri, S. Mishra, A. Bejjipurapu, V. Mika, C. Scott, N. Awalgaonkar, A. Hernandez, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* TMS Annual Meeting, San Diego, CA (2023).
51. M.S. Titus *Accelerated design and understanding of high-temperature structural alloys* University of Tokyo, Chiba, Kashiwanoha, Japan (2023). Host: Prof. Yoko Yamabe-Mitarai.
50. M.S. Titus *Deformation mechanisms in Ni<sub>2</sub>(Cr,Mo,W)-containing Haynes® 244® Ni-based superalloy* Shibaura Institute of Technology, Koto City, Tokyo, Japan (2023). Host: Prof. Ai Serizawa.
49. M.S. Titus *Accelerated design and understanding of high-temperature structural alloys* National Institute for Materials Science (NIMS), Tsukuba, Ibaraki Japan (2023). Host: Dr. Kyoko Kawagishi.
48. S. Karumuri, S. Mishra, A. Bejjipurapu, V. Mika, C. Scott, N. Awalgaonkar, A. Hernandez, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* Japanese Institute of Metals and Materials, Komaba, Tokyo, Japan (2023).
47. S. Karumuri, S. Mishra, A. Bejjipurapu, V. Mika, C. Scott, N. Awalgaonkar, A. Hernandez, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* MS&T 2022, Pittsburg, PA (2022).
46. T. Mann, M. Fahrman, M. Koslowski, and M.S. Titus *Deformation mechanisms in Imm-Ni<sub>2</sub>(Cr,Mo,W)-containing Haynes® 244® superalloy* TMS 2022 Annual Meeting, Anaheim, CA (2022).
45. A. Hernandez, S. Karumuri, Z. McClure, K. Sandhage, I. Bilonis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* MS&T 2021, Columbus, OH (2021).
44. M.S. Titus *Accelerated design of high temperature structural alloys*. University of Wisconsin - Madison (2022). Host: Jason Kawasaki.
43. M.S. Titus *Accelerated design of high temperature structural alloys*. Indiana University-Purdue University Indianapolis (2021). Host: Babak Anasori.
42. T. Mann, M. Fahrman, M.S. Titus *Deformation mechanisms in Imm-Ni<sub>2</sub>(Cr,Mo,W)-containing Haynes(R) 244(R) superalloy*. CREEP 2021. Virtual Conference (2021).
41. M.S. Titus *Deformation mechanisms in high-strength, cast Ni-based superalloys*. 2<sup>nd</sup> Annual ASM Indianapolis Chapter Conference: Metallic Alloys: Past, Present, and Future, Purdue University (2020). Host: Joel Davis.

40. M.S. Titus *Accelerated design of structural alloys*. University of Kentucky, Lexington, KY (2019). Host: Paul Rottmann.
39. M.S. Titus *Accelerated discovery and development of new high temperature structural alloys*. University of Science and Technology Beijing, Beijing, China (2018). Host: Qiang Feng.
38. M.S. Titus *Accelerated discovery and development of new high temperature structural alloys*. IMDEA Materials, Madrid, Spain (2017). Host: Dr. Jon M. Molina-Aldareguia.
37. M.S. Titus. *On the role of planar faults during creep of single crystal superalloys with  $\gamma/\gamma'$  microstructures*. Ruhr-Universität Bochum, Bochum, Germany (2016). Host: Prof. Gunther Eggeler.
36. M.S. Titus. *High temperature  $\gamma'$  shearing mechanisms from Ni- to Co-base superalloys*. Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany (2016). Host: Prof. Mathias Göken and Dr. Steffen Neumeier.
35. M.S. Titus, Rob. K. Rhein, P.B. Wells, M.J. Mills, A. Van der Ven, and T.M. Pollock. *High temperature deformation mechanisms in  $L1_2$ -containing Co-based superalloys*. Tokyo Institute of Technology, Tokyo, Japan (2015). Host: Prof. Masao Takeyama.
34. M.S. Titus, Y.M. Eggeler, A. Mottura, A. Suzuki, M.J. Mills, and T.M. Pollock. *Single Crystal Creep Deformation Mechanisms and Planar Defect Energies in  $L1_2$ -containing Co-base Superalloys*. Air Force Research Laboratory, Dayton, OH (2014). Host: Dr. Adam Pilchak.
33. M.S. Titus, Y.M. Eggeler, A. Mottura, A. Suzuki, M.J. Mills, and T.M. Pollock. *High Temperature Single Crystal Creep Deformation Mechanisms of New  $L1_2$ -containing Co-base Superalloys*. IMDEA Materials, Spain (2014). Host: Dr. Teresa Pérez-Prado.
32. M.S. Titus, Y.M. Eggeler, R.K. Rhein, A. Suzuki, M.J. Mills, and T.M. Pollock. *Single Crystal Tensile Creep Deformation Mechanisms and Planar Defect Energies in  $L1_2$ -containing Co-base Superalloys*. The Ohio State University, Columbus, OH (2013). Host: Prof. Mike Mills.
31. M.S. Titus, Y.M. Eggeler, A. Suzuki, and T.M. Pollock. *Single Crystal Tensile Creep Deformation Mechanisms in  $L1_2$ -containing Co-base Superalloys at High Temperature*. Ruhr-Universität of Bochum, Bochum, Germany (2013). Host: Prof. Gunther Eggeler.

## Contributed Oral Presentations

24. D. Smith, V. Mika, M. O'Conner, R. Golden, R.W. Trice, and M.S. Titus. *Benefits of Yttria-Doping in Ytterbium Disilicate Environmental Barrier Coatings* MS&T, Columbus, OH (2023).
23. V. Tucker, D. Wen, T. Mann, M.F. Fahrman, and M.S. Titus. *Suzuki Segregation of Transition Metal Elements in FCC Co and Ni Alloys: Electronic Origin and Alloy Design* MS&T, Columbus, OH (2023).
22. A. Hernandez, S. Karumuri, S. Mishra, Z. McClure, K. Sandhage, I. Billionis, A. Strachan, and M.S. Titus *Enabling high-strength and oxidation-resistant refractory complex, concentrated alloys via multi-fidelity experiments and simulations* IMAT, New Orleans, LA (2022).
21. C.-C. Chen, S. Tripathi, S. Yao, A. Strachan, and M.S. Titus *The effect of precipitate sizes on the thermo-mechanical properties of Ni-Ti-Hf-Al shape memory alloys* IMAT, New Orleans, LA (2022).
20. D. Wen, S. Matsunaga, M.S. Titus. *First-principles study of displacive-diffusive phase transformations during high temperature creep: from Ni- to Co-based superalloys*. TMS 2020, San Diego, CA (2020).
19. D. Wen, C.-H. Chang, S. Matsunaga, S. Antonov, G. Park, M.A. Okuniewski, D.R. Johnson, M.S. Titus. *Integrated Experimental and Computational Investigation of Strengthening in MnFeCoNi-based Alloys*. TMS 2019, San Antonio, TX (2019).
18. M.S. Titus, R.K. Rhein, A. Van der Ven, and T.M. Pollock. *Modeling segregation to stacking faults using a Clusters Approach to Statistical Mechanics (CASM)*. TMS 2018, Phoenix, AZ (2018).

17. M.S. Titus, K.N. Wertz, D.B. Miracle, J.D. Miller, F. K'ormann, B. Grabowski, H. Springer, and D. Raabe. *Accelerated discovery and development of intermetallic-containing refractory-based multi-principal-component alloys*. TMS 2017, San Diego, CA (2017).
16. M.S. Titus, R.K. Rhein, A. Mottura, M.-H. Chen, A. Van der Ven, and T.M. Pollock. *Superlattice intrinsic stacking fault energies and segregation to planar defects in Co-based superalloys*. TMS 2017, San Diego, CA (2017).
15. M.S. Titus, A. Mottura, R.K. Rhein, M.-H. Chen, A. Van der Ven, and T.M. Pollock. *The influence of stacking fault energies and solute segregation on high temperature creep strength in L1<sub>2</sub>-containing Co-based superalloys*. Beyond Ni-based Superalloys II, Cambridge, UK (2016).
14. M.S. Titus, K.N. Wertz, J.D. Miller, D.B. Miracle, and D. Raabe. *Development of high temperature refractory-based multi-principle-component alloys by thermodynamic calculations and rapid alloy prototyping*. Beyond Ni-based Superalloys II, Cambridge, UK (2016).
13. M.S. Titus, K.N. Wertz, J.D. Miller, D.B. Miracle, and D. Raabe. *Making materials in the 21st century: accelerated discovery of new high temperature structural alloys*. Network Meeting of the Alexander von Humboldt Foundation, Düsseldorf, Germany (2016).
12. M.S. Titus, R.K. Rhein, P.C. Dodge, A. Mottura, A. Van der Ven, and T.M. Pollock. *Modeling Chemical Fluctuations Across Stacking Faults in L1<sub>2</sub>-containing Co-base Superalloys Using Cluster-Assisted Statistical Mechanics*. TMS 2015, Orlando, FL (2015).
11. M.S. Titus, A. Mottura, A. Suzuki, M.J. Mills, and T.M. Pollock. *Creep deformation mechanisms and HRSTEM EDS mapping of stacking faults in L1<sub>2</sub>-containing Co-base Superalloys*. TMS 2015, Orlando, FL (2015).
10. M.S. Titus, A. Mottura, A. Suzuki, M.J. Mills, and T.M. Pollock. *Sub-nanometer Resolution Chemi-STEM EDS Mapping of Superlattice Intrinsic Stacking Faults in Co-base Superalloys*. M&M 2014, Hartford, CT (2014). [[Abstract](#)]
9. M.S. Titus, A Suzuki, M.J. Mills, and T.M. Pollock. *Sub-nanometer Resolution Chemi-STEM EDS Mapping of Superlattice Intrinsic Stacking Faults in Co-base Superalloys*. SCSMM 2014 Symposium, University of Irvine, Irvine, CA (2014). [[Abstract](#)]
8. M.S. Titus, Y.M. Eggeler, R.K. Rhein, A. Suzuki, and T.M. Pollock. *Single Crystal Creep Deformation Mechanisms and Planar Defect Energies of New Co-base Superalloys*. TMS 2014, San Diego, CA (2014).
7. M.S. Titus, Y.M. Eggeler, R.K. Rhein, A. Mottura, A. Suzuki, and T.M. Pollock. *Single Crystal Creep Deformation Mechanisms and Planar Defect Energies in L1<sub>2</sub>-containing Co-base Superalloys*. UCSB Fall Structural Seminar, UCSB, CA (2013).
6. M.S. Titus, Y.M. Eggeler, A. Suzuki, and T.M. Pollock. *Single Crystal Tensile Creep Deformation Mechanisms in L1<sub>2</sub>-containing Co-base Superalloys at High Temperature*. International Workshop on Advanced Cobalt-Base Superalloys, Bavaria, Germany (2013).
5. M.S. Titus, A. Suzuki, and T.M. Pollock. *New Co-base Alloys for Gas Turbine Engines*. ACEEES Forum 2012, Waikoloa, HI (2012).
4. M.S. Titus, A. Suzuki, and T.M. Pollock. *High Temperature Microstructure and Properties of New L1<sub>2</sub>-containing Co-Al-W Single Crystals*. Superalloys 2012, Seven Springs, PA (2012).
3. M.S. Titus, A. Mottura, A. Suzuki, and T.M. Pollock. *High Temperature Microstructure and Properties of New L1<sub>2</sub>-containing Co-Al-W Alloys*. TMS 2012, Orlando, FL (2012).
2. M.S. Titus, J. Zhu, A. Mottura, A. Suzuki, and T.M. Pollock. *High Temperature Microstructure and Properties of New L1<sub>2</sub>-containing Co-Al-W Alloys*. MS&T 2011, Columbus, OH (2011).
1. M.S. Titus and R. Sooryakumar. *Nanocrystallinity and enhancing magnetism in soft Fe-Si-Nb-Cu alloys*. The American Physical Society Regional Meeting, Miami University, Oxford, OH (2008).



## Teaching

Materials Engineering, Purdue University, West Lafayette, IN

**Spring 2023** MSE 340, Transport Phenomena, Instructor

**Fall 2022** MSE 250, Physical Properties in Engineering Systems, Instructor

**Spring 2022** MSE 597, Superalloys - High Temperature, Instructor

**Fall 2021** MSE 250, Physical Properties in Engineering Systems, Instructor

**Spring 2021** MSE 536, Solidification Processing, Instructor

**Fall 2020** MSE 190, Introduction to Materials Engineering, Instructor

**Spring 2020** MSE 597, Superalloys - High Temperature, Instructor

**Fall 2019** MSE 235, Materials Properties Laboratory, Instructor

**Spring 2019** MSE 536, Solidification Processing, Instructor

**Fall 2018** MSE 235, Materials Properties Laboratory, Instructor

**Spring 2018** MSE 235, Materials Properties Laboratory, Instructor

**Spring 2017** MSE 536, Solidification Processing, Instructor

Materials Department, University of California, Santa Barbara, CA

**Spring 2015** Dislocations and Dislocation Dynamics, Teaching Assistant

**Winter 2011** Structure and Properties of Materials II, Teaching Assistant

Department of Physics, The Ohio State University, Columbus, OH

**Winter 2010** Honors Physics: Electricity and Magnetism, Laboratory Instructor

**Spring 2010** Honors Physics: Thermal and Quantum Physics, Laboratory Instructor Professional Workshops

**2018** MS&T 2018 Annual Meeting, Emerging Technologies Workshop, "Density Functional Theory and Ising-Based Models"

## Former Postdoctoral Researchers

Purdue University, West Lafayette, IN

**Aug 2020–Feb 2022** Logan Ware

## Former Ph.D. Students

Purdue University, West Lafayette, IN

**Aug 2019–May 2023** Thomas Mann (Ph.D. MSE)

Thesis Title: "Theoretical and experimental investigation of deformation in Imm-Ni<sub>2</sub>(Cr, Mo, W) strengthened Haynes® 244® alloy"

**Jan 2021–Dec 2022** Blair Francis (Ph.D. AAE, Co-advised with Prof. Tim Pourpoint)

Thesis Title: "Reduction of autoxidative fouling rates on aerospace alloys via oleophobic surface modifications"

**Sep 2017–May 2022** Dongsheng Wen (Ph.D. MSE)

Thesis Title: "Solid-solution strengthening and Suzuki segregation in Co- and Ni-based alloys"

**Aug 2016–Dec 2021** Sae Matsunaga (Ph.D. MSE)

Thesis Title: "Design and processing of NiCo-based superalloys for the study of solute segregation at planar defects during high temperature deformation"

**Aug 2016–Dec 2021** Shivam Tripathi (Ph.D. MSE, Co-advised with Prof. Alejandro Strachan)

Thesis Title: "Exploring the tunability of martensitic transformation in shape memory alloys via coherent second phase"

## Former Masters Students

Purdue University, West Lafayette, IN

**Aug 2021–May 2023** Dawson Smith (Co-advised with Prof. Rodney Trice)

Thesis Title: "Optimizing pre-service heat treatments in ytterbium disilicate-based environmental barrier coatings"

**Aug 2020–May 2022** Austin Hernandez (M.S. MSE, Co-advised with Prof. Kenneth Sandhage)

Thesis Title: "High-throughput Calculations and Experimentation for the discovery of refractory

complex concentrated alloys with high hardness”

**Aug 2019–Dec 2021** Benjamin Smith (M.S. MSE, Co-advised with Prof. Tim Pourpoint)  
Thesis Title: “Surface Roughness behavior in electrochemically-etched Fe- and Ni-based Alloys”

**Aug 2019–Aug 2021** Sona Avetian (M.S. MSE, Co-advised with Prof. Ken Sandhage)  
Thesis Title: “A chemical/powder metallurgical route to fine-grained refractory alloys”

**Sep 2016–Jul 2018** Chia-Hsiu Chang (M.S. MSE)  
Thesis Title: “Solid-solution strengthening of FCC complex, concentrated alloys”

## Former Undergraduate Students

Purdue University, West Lafayette, IN

Junjie Li, Aleena Masaeng, Megh Kansara, Zachary Logar, Noah Mcneany, Regina Park, Cameron Hillsman, Vincent Mika, Tess Obuchowski, Collin Scott, Jaclyn Lane, Carolina Francis, David Ho, Matias Filloy, Thomas Deucher, Chadwick Choy, Haydn Schroader (Howmet), Shelby McClain, Brynna Kelly (Moog Space and Defense Group), Mallory Benoit, Natalie Carter (L3Harris Technologies), Jack Mason (Stepan Company), Sam Inman (UVA), Austin Beggs (Dana Incorporated), Tyler Lucas (MIT), Jacob Melvin (Harrison Steel Castings), Brooke Prestin (Stage 2 Contract Engineering), Muqiao Su, Rachel Mooar (NAVSEA Warfare Centers), Owen Wellborn (Rolls-Royce), Matthew Higgins (University of Michigan)

## Former High School Students

Purdue University, West Lafayette, IN

Ian Eddy (2019, Jefferson High School, Purdue University)  
Justin Cooper (2018, Jefferson High School, Purdue University)

## Senior Design Projects

Purdue University, West Lafayette, IN

**2022–2023** Grace Jensen, Heather Shrote, Jalen Macatangay, Sponsor: Haynes International

**2022–2023** Will Heffern, Matias Filloy, Spencer Hagaman, Sponsor: Carpenter Technologies

**2021–2022** Hannah Doyle, Hugh P. Grennan, Dane O. Moebius, Tyler S. Muller, Madeline K Schroeder, Sponsor: Howmet

**2021–2022** Sebastian Elizondo, David E. Farache, John G. “Jack” Gulley, George M. “Joji” Nishibuchi, Sponsor: Haynes International

**2020–2021** Amanda L. Guyre, Riley N. Plotner, Bryan M. Adams, Bryce G. McKenzie, Sponsor: Haynes International.

**2019–2020** Kyle Petrosky, Margaret A. Serewicz, Jack T. Siwajek, Michael G. Wardeburg, Sponsor: Haynes International.

**2018–2019** Samuel B. Inman, Adam D. Smith, Rachel M. Nederhoed, Analiese M. Long, Sponsor: AIM-MRO and GE

**2018–2019** Harley J. Rowland, Austin D. Beggs, Tze Jian Tay, Anthony E. Pupillo, Sponsor: Haynes International

**2017–2018** Eric C. Rohrbach, Grant L. Hinkle, Adam J. Miller, Samuel W. Humphrey, Sponsor: Haynes International

**2016–2017** Alex V. Post, Alex W. Kaiser, John F. Schrader, Jared D. Smith, Sponsor: Haynes International

## Summer Undergraduate Research Fellowship (SURF) Program

Purdue University, West Lafayette, IN

**Jun 2022–Aug 2022** Noah Hallberg (Purdue University, West Lafayette, IN)

**Jun 2020–Aug 2020** Haydn Schroader (Purdue University, West Lafayette, IN)

**Jun 2017–Aug 2017** Anjola Uprety (Wesleyan College, Macon, GA)

## Current Ph.D. Students

Purdue University, West Lafayette, IN

**Jan 2024**– Dina Khattab (Co-advised with Prof. Paul Mort)

**Aug 2023**– Conner Cleek

**Aug 2023**– Xiaoling Shen (Co-advised with Prof. Jeffrey Youngblood)

**Aug 2022**– Akhil Bejjipurapu (Co-advised with Prof. Kenneth Sandhage)

**Aug 2022**– Sivasubramanian Chandramouli (Co-advised with Prof. Michael Sealy)

**Aug 2021**– Victoria Tucker

**Jan 2021**– Ching-Chien Chen (Co-advised with Prof. Alejandro Strachan)

## Current Masters Students

Purdue University, West Lafayette, IN

**Aug 2023**– Murtaza Siddiqi (Co-advised with Prof. Kenneth Sandhage)

**Aug 2023**– Vincent Mika (Co-advised with Prof. Rodney Trice)

## Current Undergraduate Students

Purdue University, West Lafayette, IN

**Sep 2023**– Jonah Brinkerhuff, David Estrella, Jacob Fish, Nargi Golashi, Isabella Gueth, Noah Harpenau, Sajjad Hayder

**Sep 2022**– Owen Appel, Nicholas Borina

**Jan 2022**– Erik Bowes

## Service at Purdue University

Committee Work

**2021** Faculty Search Committee, Member

**2021-2022** EVPRP Electron Microscopy Task Force, Member

**2018-2023** Equipment Committee, Chair

**2017-2023** Graduate Committee, Member

**2016-2023** Equipment Committee, Member

Professional Preparation

**Oct 2021** “Unraveling the mysteries of faculty applications Pt. I” with Engineering Academic Career Club (and L. Blumenschein, B. Tackett, C. Proctor, Philip Paré)

**Summer 2021** Engineering Academic Career Club mentoring circle, Faculty Mentor

**Summer 2019** Engineering Academic Career Club mentoring circle, Faculty Mentor

**Mar 2019** “Unraveling the mysteries of faculty applications Pt. I” with Engineering Academic Career Club (and C. Davis, K. Solomon, V. Narshimhan)

Outreach

**Apr 2019** WIEP JEEP MSE Co-Organizer

**Apr 2018** WIEP JEEP Sunday Welcome

**Apr 2017** WIEP JEEP Sunday Welcome

## Undesired outcomes

Rejected degree programs

**2006** Case Western Reserve University, B.S. program

Rejected faculty applications

**2014** École polytechnique fédérale de Lausanne, Switzerland

**2014** Georgia Institute of Technology

**2014** North Carolina State University

**2014** Colorado School of Mines

Rejected award applications

- 2016** Best Student Paper, *Acta Materialia*
- 2016** TMS Young Professional Development Award
- 2016** ORAU Ralph E. Powe Junior Faculty Enhancement Award
- 2019** TMS Young Leaders International Scholar Award
- 2020** ASM Bradley Stoughton Award for Young Teachers
- 2022** TMS Early Career Award
- 2023** Fulbright Fellowship

Rejected federal funding, as lead PI

- 2018** NSF DMR MMN
- 2018** DOE NEUP
- 2019** 2x DOE NEUP
- 2019** DOD ONR MURI
- 2020** DOE ARPA-E ULTIMATE Concept Paper
- 2022** DOD DEPSCoR Concept Paper

Rejected manuscripts

- 4x *Acta Materialia*
- 1x *Scripta Materialia*
- 1x *Science*
- 1x *Journal of Alloys and Compounds*
- 1x *Nature Communications*
- 1x *Superalloys*