

ZHOU, CAIZHI

Associate Professor
Department of Mechanical Engineering
College of Engineering and Computing
University of South Carolina
Email: caizhi@mailbox.sc.edu

EDUCATION

Ph.D. in Materials Science and Engineering, December 2010

Iowa State University, Ames, IA

Dissertation: Dislocation Dynamics Simulations of Plasticity at Small Scales

Advisor: Dr. Richard LeSar

M.S. in Materials Processing Engineering, March 2006

Tianjin University, Tianjin, China

Thesis: Investigation of Fatigue Properties of Friction Stir Welding on Aluminum Alloys

Advisor: Dr. XinqiYang

B.S. in Metallic Materials Science and Engineering, June 2003

Tianjin University, Tianjin, China

EXPERIENCE

- Associate Professor, **University of South Carolina**, Jan. 2020 – Present
- Associate Professor, **Missouri University of Science and Technology**, Sep. 2019 – Dec. 2019
- Assistant Professor, **Missouri University of Science and Technology**, Jan. 2013 – Aug. 2019
- Postdoctoral Researcher, **Los Alamos National Laboratory**, Jan. 2011 – Dec. 2012
- Graduate Research Assistant, **Iowa State University**, Jan. 2007 – Dec. 2010
- Graduate Research Assistant, **Tianjin University**, Sep. 2003 – Mar. 2006

PUBLICATIONS

(Book chapters)

1. S. Shao, **C. Zhou**, A. Misra and J. Wang, "Mesoscale Modeling of Dislocation-Interactions in Multilayered Materials", Handbook of Materials Modeling: Methods: Theory and Modeling edited by W. Andreoni and S. Yip, Springer (2018).

(Peer-reviewed journal articles)

51. J. Wang, T. Chen and **C. Zhou**, "Crystal plasticity modeling of fretting fatigue behavior of an aluminum alloy", Tribology International (2020) under reviewing.
50. H. Li, T. Chen, W. Li, S. Han, **C. Zhou**, Z. Chen, E.A. Flores-Johnson, L. Shen, J. Lian, I.J. Beyerlein, X. Liao, "Grain size dependent microstructure and texture evolution during dynamic deformation of nanocrystalline face-centered cubic materials", Acta Materialia (2020) under reviewing.
49. S. Dong, T. Chen, N. Li and **C. Zhou**, "Thickness-dependent shear localization in Cu/Nb metallic nanolayered composites", Scripta Materialia (2020) 187, 323.
48. H. Wei, X. Dai, P. Han, **C. Zhou** and Y. Wei, "Surface mechanical attrition treatment-induced dissolution of Cu₄Ti precipitates in Cu-4wt-%Ti alloy", Materials Science and Technology, (2020) (2020) 36, 661.

47. J. Duan, H. Wen, **C. Zhou**, I. Rinat, R. Valiev, "Discontinuous grain growth in an equal-channel angular pressing processed Fe-9Cr steel with a heterogeneous microstructure", *Materials Characterization*, (2020) 159: 110004.
46. P. Adhikari; S. San; **C. Zhou**; R. Sakidja and W-Y Ching, "Electronic structure and mechanical properties of crystalline precipitate phases M₂₃C₆ (M = Cr, W, Mo, Fe) in Ni-based superalloys", *Materials Research Express*, (2020) 6: 116323.
45. S. Huang, I. J. Beyerlein and **C. Zhou**, "Unusual size effects from tilted twin boundaries in nanotwinned metals", *Extreme Mechanics Letters*, *Extreme Mechanics Letters*, (2019) 32: 100571.
44. T. Chen, I. J. Beyerlein and **C. Zhou**, "Predicting the size scaling in strength of nanolayered materials by a discrete slip crystal plasticity model", *International Journal of Plasticity*, (2020) 124: 247.
43. T. Chen, R. Sakidja, W-Y Ching and **C. Zhou**, "Crystal plasticity modeling of void growth on grain boundaries in Ni-based superalloys", *JOM: Journal of the Minerals, metals, and Materials Society*, (2019) 71, 3859.
42. H. Wei, X. Dai, P. Han, **C. Zhou** and Y. Wei, "Age hardening studies of a Cu-4Ti-Cr-Fe alloy", *Materials Science and Technology*, (2019) 35: 1848.
41. J. Duan, H. Wen, **C. Zhou**, I. Rinat, X. Li, "Evolution of microstructure and texture during annealing in a high-pressure torsion processed Fe-9Cr alloy", *Materialia*, (2019) 6: 100349.
40. S. Huang and **C. Zhou**, "Fracture resistance of Cu/Nb metallic nanolayered composite", *Journal of Materials Research*, (2019) 34: 1533.
39. T. Chen and **C. Zhou**, "Crystal plasticity modeling the deformation in nanodominated heterogeneous materials", *Journal of Materials Research*, (2019) 34: 1555.
38. T. Chen and **C. Zhou**, "Effect of the grain size and distribution of nanograins on the deformation of nanodominated heterogeneous nickel", *Materials Letters*, (2019) 236: 661.
37. J. Wang, Q. Li, C. Yang and **C. Zhou**, "Dynamic response and damage character of road embankment under strong earthquake", *International Journal of Distributed Sensor Networkss* (2018) 14: 35.
36. J. Wang, Q. Li, C. Yang and **C. Zhou**, "Repeated loading model for elastic-plastic contact of geomaterials", *Advances in Mechanical Engineering* (2018) 10: 1.
35. J. Wang and **C. Zhou**, "Finite element analysis of the wear fatigue of rails with gradient structures", *Materials Letters* (2018) 231: 35.
34. H. Wei, Y. Cui, H. Cui, **C. Zhou** and Y. Wei, "Evolution of grain refinement mechanism in Cu-4wt.%Ti alloy during surface mechanical attrition treatment", *Journal of Alloys and Compounds* (2018) 736: 835.
33. S. Huang, J. Wang, N. Li, J. Zhang and **C. Zhou**, "Atomistic simulations of plasticity in heterogeneous nanocrystalline Ni lamella", *Computational Materials Science* (2018) 141: 229.
32. S. Huang, J. Wang, and **C. Zhou**, "Deformation of heterogeneous nanocrystalline lamella with a pre-existing crack", *JOM: Journal of the Minerals, metals, and Materials Society*, (2018) 70: 60.
31. S. Huang, I. J. Beyerlein and **C. Zhou**, "Nanograin size effects on the strength of biphas nanolayered composites", *Scientific Reports*, (2017) 7: 11251.
30. S. Huang and **C. Zhou**, "Modeling and simulation of nanoindentation: a review", *JOM: Journal of the Minerals, metals, and Materials Society* (2017) 69: 2256.
29. R. Yuan, I. J. Beyerlein and **C. Zhou**, "Homogenization of plastic deformation in heterogeneous lamella structures", *Materials Research Letters*, (2017) 5: 251.
28. R. Yuan, I. J. Beyerlein and **C. Zhou**, "Coupled crystal orientation-size effects on the strength of nano crystals", *Scientific Reports*, (2016) 6: 26254.
27. R. Yuan, I. J. Beyerlein and **C. Zhou**, "Statistical dislocation activation from grain boundaries and its role in the plastic anisotropy of nanotwinned copper", *Acta Materialia*, (2016) 110: 8.

26. N. Li and **C. Zhou**, "Dynamic Probing of Microstructure Evolution in Nanostructured Materials", *JOM*, (2016) 68: 224.
25. S. Huang, J. Wang and **C. Zhou**, "Effect of plastic incompatibility on the strain hardening behavior of Al-TiN nanolayered composites", *Materials Science and Engineering A*, (2015) 636: 430.
24. R. Yuan, I. J. Beyerlein and **C. Zhou**, "Emergence of grain-size effects in nanocrystalline metals from statistical activation of discrete dislocation sources", *Acta Materialia*, (2015) 90: 169.
23. **C. Zhou**, C. Reichhardt, C. J. O. Reichhardt and I. J. Beyerlein, "Dynamic Phases, Pinning, and Pattern Formation for Driven Dislocation Assemblies", *Scientific Reports*, (2015) 5: 8000.
22. **C. Zhou**, C. Reichhardt, C. J. O. Reichhardt and I. J. Beyerlein, "Random organization in periodically driven gliding dislocations", *Physics Letters A*, (2014) 378: 1675.
21. J. Wang, **C. Zhou**, I. J. Beyerlein and S. Shao, "Modeling Interface-Dominated Mechanical Behavior of Nanolayered Crystalline Composites", *JOM*, (2014) 66: 102.
20. J. Wang, R. Zhang, **C. Zhou**, N. Li, I. J. Beyerlein and A. Misra, "Interface dislocation patterns and dislocation Nucleation in Face-centered-cubic and Body-centered-cubic Bi-crystal Interfaces", *International Journal of Plasticity*, (2014) 53: 40.
19. J. Wang, R. Zhang, **C. Zhou**, I. J. Beyerlein and A. Misra, "Characterizing interface dislocations by atomically informed Frank-Bilby theory", *Journal of Materials Research*, (2013) 28: 1646.
18. **C. Zhou**, J. J. Su, M. J. Graf, C. Reichhardt, A. V. Balatsky and I. J. Beyerlein, "Plastic response of dislocation glide in solid helium under dc strain-rate loading", *Physical Review B*, (2013) 88: 024513.
17. **C. Zhou**, J. J. Su, M. J. Graf, C. Reichhardt, A. V. Balatsky and I. J. Beyerlein, "Comment on "Giant Plasticity of a Quantum Crystal", *Physical Review Letters*, (2013) 111: 119601.
16. H. Chu, **C. Zhou**, J. Wang and I. J. Beyerlein, "An analytical model for the critical shell thickness in core/shell nanowires based on crystallographic slip", *Journal of the Mechanics and Physics of Solids*, (2013) 67: 2147.
15. H. Chu, **C. Zhou**, J. Wang and I. J. Beyerlein, "Misfit strain relaxation mechanisms in core/shell nanowires", *JOM*, (2012) 64: 1258.
14. **C. Zhou**, J. J. Su, M. J. Graf, C. Reichhardt, A. V. Balatsky and I. J. Beyerlein, "Dislocation-induced anomalous softening of solid helium", *Philosophical Magazine Letters*, (2012) 92: 608.
13. **C. Zhou** and R. LeSar, "Dislocation dynamics simulations of plasticity in polycrystalline thin film", *International Journal of Plasticity*, (2012) 30-31: 185.
12. **C. Zhou** and R. LeSar, "Dislocation dynamics simulations of the Bauschinger effect in metallic thin films", *Computational Materials Science*, (2012) 54: 350.
11. **C. Zhou**, I. J. Beyerlein and R. LeSar, "Plastic deformation mechanisms of FCC single crystals at smallscales", *Acta Materialia*, (2011) 59: 7673.
10. H. Chu, J. Wang, **C. Zhou** and I. J. Beyerlein, "Self-energy of elliptical dislocation loops in anisotropic crystals and its application for defect-free core/shell nanowires", *Acta Materialia*, (2011) 59: 7114.
9. **C. Zhou**, S. B. Biner, and R. LeSar, "Simulations of the Effect of Surface Coatings on Plasticity at Small Scales", *Scripta Materialia*, (2010) 63:1096.
8. **C. Zhou**, S. B. Biner, and R. LeSar, "Discrete dislocation dynamics simulations of plasticity at small scales", *Acta Materialia*, (2010) 58: 1565.
7. **C. Zhou**, X. Yang, and G. Luan, "Effect of oxide array on the fatigue property of friction stir welds", *Scripta Materialia*, (2006) 54: 1515.
6. **C. Zhou**, X. Yang, and G. Luan, "Effect of kissing bond on fatigue behavior of friction stir welds on Al 5083 alloy", *Journal of Materials Science*, (2006) 41: 2771.
5. **C. Zhou**, X. Yang, and G. Luan, "Investigation of microstructures and fatigue properties of friction stir

welded Al-Mg alloy", *Materials Chemistry and Physics*, (2006) 98: 285.

4. **C. Zhou**, X. Yang, and G. Luan, "Effect of root flaws on the fatigue property of friction stir welded 2024-T3 Al alloy", *Materials Science and Engineering A*, (2006) 418: 155.
3. **C. Zhou**, X. Yang, and G. Luan, "Research progress on the fatigue behavior of friction stir welded joints", *Rare Metal Materials and Engineering*, (2006) 35: 1172. (In Chinese)
2. **C. Zhou**, X. Yang, and G. Luan, "Comparative study on fatigue properties of friction stir and MIG-pulse welded joints in 5083 Al-Mg alloy", *Transactions of Nonferrous Metals Society of China* (2005) 15:789.
1. **C. Zhou**, X. Yang, and G. Luan, "Fatigue properties of friction stir welds in 5083 Al alloy", *Scripta Materialia*, (2005) 53:1187.

CONFERENCE PRESENTATIONS

30. **C. Zhou** and S. Huang, "Impact of Internal Defects on the Deformation of Nanocrystalline Materials", TMS Annual Meeting, San Antonio, TX, 2019.
29. **C. Zhou**, T. Chen, R. Sakidja and W.-Y. Ching, "Effect of the crystallographic orientation on the void growth during creep of superalloys", TMS Annual Meeting, San Antonio, TX, 2019. (Invited talk)
28. **C. Zhou** and S. Huang, "Transition from the thickness-dependent to thickness-independent strength in the nano-twinned metals", TMS Annual Meeting, San Antonio, TX, 2019.
27. **C. Zhou** and S. Huang, "Understating the deformation and fracture behaviors of heterogeneous lamella structuresrgmst/publications", TMS Annual Meeting, Phoenix, AZ, 2018. (Invited talk)
26. **C. Zhou**, S. Huang and R. Yuan, "Exploring the Deformation and Ductility of Metallic Heterogeneous Lamella Structures by Crystal Plasticity and Atomistic Modelings", International Symposium on Plasticity, Puerto Rico, 2018. (Keynote talk)
25. R. Sakidja, P. Simanjuntak, **C. Zhou**, "Theory, Manufacturing and Applications of Ceramic/Metal (CerMet) Nano-laminates", *Materials Science & Technology*, Pittsburgh, PA. 2017. (Talk)
24. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Homogenization of plastic deformation in heterogeneous lamella structures", TMS Annual Meeting, San Diego, CA, 2017. (Invited talk)
23. P. Simanjuntak, R. Sakidja, **C. Zhou**, "Development of Many-body Potentials for Al-TiN Nanolayered Composites", *Materials Science & Technology*, Salt Lake City, UT. 2016. (Talk)
22. I. Ghamarian, **C. Zhou**, R. LeSar, P. Collins, "An Integrated Computational and Experimental Approach to Determine Dislocation Density Distributions", *Materials Science & Technology*, Salt Lake City, UT. 2016. (Talk)
21. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Discrete Crystal Plasticity Finite Element Modeling the Plastic Anisotropy in Nanotwinned Copper", The 53rd. Annual Meeting of the Society of Engineering Science, University of Maryland, College Park, MD. 2016. (Invited talk)
20. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Analysis of Plastic Anisotropy in Nanotwinned Copper by a Statistical Grain Boundary Dislocation Model", *Dislocations 2016 - Purdue Conferences*, West Lafayette, IN, 2016 (Talk)
19. **C. Zhou**, "Multiscale Modeling of Crystal Plasticity in Nanocrystalline Metals", 2016 International Symposium on Structural Integrity, Tianjin, China, 2016. (Invited talk)
18. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Coupled crystal orientation-size effects on the strength of nano crystals", TMS Annual Meeting, Nashville, TN, 2016. (Invited talk)
17. J. Wang, S. Shao, N. Li and **C. Zhou**, "Multiscale Perspective of Exploring Interface Roles in Metal-Ceramics Composites", The 52nd. Annual Meeting of the Society of Engineering Science, College Station, TX. 2015. (Invited talk)

16. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Understanding the effects of dislocation emissions and crystallographic textures on grain-size dependent behavior of nanocrystalline metals", The 52nd. Annual Meeting of the Society of Engineering Science, College Station, TX. 2015. (Invited talk)
15. J. Wang, S. Shao, **C. Zhou** and A. Misra, "Exploring the Role of Interfaces in Metal-Ceramics composites from Atomic to Continuum Scales", TMS Annual Meeting, Orlando, FL, 2015. (Invited talk)
14. **C. Zhou**, S. Huang and J. Wang, "Analysis of Mechanical Behavior of Metal-Ceramic Nanolayered Composites by Dislocation Dynamics Simulations", International Symposium on Plasticity, Jamaica, 2015. (Invited talk)
13. **C. Zhou**, R. Yuan and I. J. Beyerlein, "Crystal Plasticity Analysis of Deformation Behavior of Nanocrystalline Nickel", The 51st. Annual Meeting of the Society of Engineering Science, West Lafayette, IN. 2014. (Invited talk)
12. **C. Zhou**, "3D discrete dislocation dynamics simulations of plasticity in Al-TiN nanolayered composites", TMS Annual Meeting, San Diego, CA, 2014. (Talk)
11. **C. Zhou**, " Mechanical response of Al-TiN nanolayered composites: 3D discrete dislocation dynamics analysis", 50th Annual Technical Meeting of The Society of Engineering Science, Providence, RI, 2013. (Talk)
10. **C. Zhou**, J. Wang, H. Chu, I. J. Beyerlein, "Dislocation dynamics simulations of materials with interfaces", Mesoscale and Continuum Scale Modeling of Materials Defects Workshop, Los Angeles, CA, 2012. (Poster, NSF travel award)
9. **C. Zhou**, J. Wang, H. Chu, I. J. Beyerlein, "Dislocation dynamics simulations of materials with interfaces", 49th Annual Technical Meeting of The Society of Engineering Science, Atlanta, GA, 2012. (Talk)
8. **C. Zhou**, J. Wang, I. J. Beyerlein, "Atomically-informed dislocation dynamics simulations of nano-composites", TMS Annual Meeting, Orlando, FL, Mar. 2012. (Talk)
7. **C. Zhou**, J. Wang, H. Chu, I. J. Beyerlein, C. A. Bronkhorst, "Atomistically Informed Dislocation Dynamics Simulations on Dislocation-Interface Interactions", The 23rd Annual Rio Grande Symposium on Advanced Materials, Albuquerque, NM, 2011. (Invited talk)
6. R. LeSar, **C. Zhou**, "Plasticity at Small Scales", TMS Annual Meeting, San Diego, CA, 2011. (Invited talk)
5. **C. Zhou**, R. LeSar, "Discrete Dislocation Simulations of Plasticity of Polycrystalline Thin Films", TMS Annual Meeting, San Diego, CA, 2011. (Talk)
4. **C. Zhou**, R. LeSar, "Dislocation Dynamics Simulations of Plasticity at Small Scales", The 47th. Annual Meeting of the Society of Engineering Science, Ames, IA, 2010. (Talk)
3. **C. Zhou**, R. LeSar, "Dislocation dynamics simulations of small-scale plasticity in FCC single crystals", GRC-Thin Film & Small Scale Mechanical Behavior, Waterville, ME, 2010. (Poster)
2. **C. Zhou**, S. B. Biner, R. LeSar, "3D dislocation dynamics simulations of size-dependent behavior of FCC single crystals", GRC-Physical Metallurgy, Andover, NH, 2009. (Poster)
1. **C. Zhou**, S. B. Biner, R. LeSar, "3D dislocation dynamics simulations of plasticity in small volumes", TMS Annual Meeting, San Francisco, CA, 2009. (Poster)

TEACHING EXPERIENCE

EMCH 200 – Statics, Spring 2021

EMCH 371 – Materials, Fall 2020

AERO 3877 – Principles of Engineering Materials, Fall 2019

MET 3120 – Fundamental Behavior of Materials, Fall 2019

MET 2125 – Microstructural Development Laboratory, Spring 2019
MET 3120 – Fundamental Behavior of Materials, Fall 2018
MET 2125 – Microstructural Development Laboratory, Spring 2018
MET 3125 – Mechanical Testing of Materials Laboratory, Fall 2017
MET 3120 – Fundamental Behavior of Materials, Fall 2017
MET 5620 – Materials Behaviors, Spring 2017
MET 2125 – Microstructural Development Laboratory, Spring 2017
MET 3125 – Mechanical Testing of Materials Laboratory, Fall 2016
MET 3120 – Fundamental Behavior of Materials, Fall 2016
MET 2125 – Microstructural Development Laboratory, Spring 2016
MET 3120 – Fundamental Behavior of Materials, Fall 2015
MET 2125 – Microstructural Development Laboratory, Spring 2015
MET 3120 – Fundamental Behavior of Materials, Fall 2014
MET 218 – Microstructural Development Laboratory, Spring 2014
MET 215 – Mechanical Behavior of Materials, Fall 2013
MET 218 – Microstructural Development Laboratory, Spring 2013

ADVISING GRADUATE AND UNDERGRADUATE STUDENTS

- Postdoctoral Advisor of Dr. Jiaqi Duan (Materials Science & Engineering) since November 2017
- Ph.D. advisor of
Shujing Dong, expected graduation in May 2022
Dissertation Title: “Exploring the effect of grain boundary types of fracture behavior in face-centered cubic polycrystalline metals”
Tianju Chen, expected graduation in December 2020
Dissertation Title: “Crystal plasticity modeling the void growth during creep of superalloy”
Sixie Huang, graduated in May 2019
Dissertation Title: “Atomistic modeling the deformation in metallic nanolayered composites”
Rui Yuan, graduated in July 2017
Dissertation Title: “Understanding the deformation mechanisms in nanostructured metals by a novel discrete crystal plasticity finite element model”
- Ph.D. thesis committee member of Elizabeth Burns, Caitlin Kriewall, Myranda Ferris, Lei Yan, Avik K. Mahata, Leiren Jarvis, Mohsen Beyramali Kivi, Dr. Arezoo Emdadim (completed April 2018) Dr. Syamala R. Pulugurtha (completed July 2014)
- M.S. thesis committee member of Nihal Acharya (completed January 2016) and Harihar Rakshit Sistla (completed April 2014).

PROFESSIONAL AFFILIATIONS

- Minerals, Metals, & Materials Society (TMS)
- American Society of Materials (ASM)
- American Society of Mechanical Engineers (ASME)

SERVICE TO PROFESSIONAL SOCIETIES OR ASSOCIATIONS

- Committee member of TMS Mechanical Behavior of Materials, Nanomechanical Materials Behavior,

Shaping and Forming Committee

- Organizer of Symposium on “Ultrafine-grained Heterostructured Materials”, TMS 149th Annual Meeting and Exhibition, San Diego, California, 03/2020
- Organizer of Symposium on “Interface-Mediated Properties of Nanostructured Materials”, TMS 146th Annual Meeting and Exhibition, San Diego, California, 03/2017
- Mentor for TMS Mentor Program, TMS 145th Annual Meeting and Exhibition, Nashville, Tennessee, 03/2016
- NSF Panel Review Member for Metals and Metallic Nanostructures Program, 01/2016
- Co-organizer of Symposium on “Dynamic Probing of Microstructure Evolution in Nanostructured Materials”, TMS 2015 144th Annual Meeting and Exhibition, Orlando, FL
- NSF Panel Review Member for NSF-Materials Engineering and Processing Program, 05/2015

HONORS AND AWARDS

National Science Foundation (NSF) CAREER Award, 2017

TMS Young Leaders Professional Development Award, 2015

NSF postdoctoral travel award, "Materials Defects" workshop, UCLA, 2012.

Research Excellence Award, sponsored by Iowa State University, Ames, IA, 2010.

Three “ScienceDirect TOP25 Hottest” Articles.

1st place in Interinstitutional Academic Competition sponsored by Tianjin University & Nankai University, China, 2006.

Excellent Master Graduate Thesis Award, sponsored by Tianjin University, China, 2006.

‘Rong Zhijian’ Research Excellence Award, sponsored by Tianjin University, China, 2005.

REVIEWERSHIP FOR PEER REVIEWED JOURNALS

1. Nature Communications
2. Acta Materialia
3. Scripta Materialia
4. International Journal of Plasticity
5. Metallurgical and Materials Transactions A
6. Materials Science and Engineering A
7. International Journal of Fatigue
8. Materials & Design
9. Materials Research Letters
10. Journal of Materials Processing Technology
11. Computational Materials Science
12. Journal of Alloys and Compounds
13. Materials Characterization
14. Applied Surface Science
15. Modelling and Simulation in Materials Science and Engineering
16. Journal of Materials Research
17. Journal of Materials Science