

Nicholas A. Richter

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Education:

- Purdue University:
 - PhD Candidate in Materials Engineering.....**Aug. 2018 – May 2023**
 - Thesis Topic / Advisor: Nanotwinned Al alloys / Dr. Xinghang Zhang (xzhang98@purdue.edu)
 - GPA: 3.92 / 4.0
 - Magnetron sputtering, nanoindentation and lab safety manager
 - Bachelor of Science in Materials Engineering..... **May 2018**

Skills

- Characterization:
 - X-ray diffraction (XRD), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Optical Microscopy/Metallography, Focused Ion Beam (FIB), Energy-dispersive X-ray Spectroscopy (EDS), Electron Backscatter Diffraction (EBSD) and Automated crystallographic orientation and phase mapping in the TEM (ASTAR).
- Materials synthesis:
 - Physical vapor deposition (magnetron sputtering). DC sputtering of metallic films, reactive sputtering of compounds and RF sputtering of non-conductive materials; Metal additive manufacturing (laser powder bed fusion); arc melting; casting
- Mechanical testing:
 - Nanoindentation, nanoscratch testing, *in-situ* micropillar compression, bulk tension testing, *in-situ* tension testing (SEM)
- AutoCAD software and coding languages Python and MATLAB

Research Experience:

- Oak Ridge National Laboratory – Postdoctoral Research Associate (CURRENT).....**Oct. 2023 – Current**
 - Used alloy design to explore challenges related to sustainable Al alloys and high conductivity Al alloys
 - Applied mechanical testing & microscopy to link property-structure relationships in sustainable Al alloys
- Purdue University – Graduate Research Assistant:**Aug. 2018 – May 2023**
 - Utilized *in-situ* micropillar compression, nanoindentation, XRD, and TEM techniques to characterize the microstructural evolution and mechanical properties of nanotwinned Al alloys.
 - Utilized magnetron sputtering on various Si substrates to explore nanotwinned Al alloy design.
- ASML/Purdue University – Undergraduate Research Project.....**Aug. 2017 – Apr. 2018**
 - Studied corrosion resistance of refractory alloys exposed to liquid tin for EUV Lithography applications
 - Designed and constructed corrosion testing apparatus replicating conditions seen in EUV lithography.
- Purdue Undergraduate Research: (Sponsor: Dr. John Blendell).....**Aug. 2016 – Oct. 2017**
 - Analyzed nucleation of whiskers in tin-based lead-free solders by electroplating tin onto copper.

Work Experience:

- Nucor Steel Decatur, Inc – Metallurgical Engineering Intern.....**May 2017 – Aug. 2017**
 - Completed OSHA safety training at a V.P.P. certified site
 - Studied inclusion development in various grades of steel at a Ladle Metallurgical Furnace
 - Utilized SEM to study steel inclusions and XRD to characterize slag compositions
- ArcelorMittal/Purdue (Dr. John Krane)**Sep. 2015 – May 2016**
 - Created a user-interactive computational model using Python of the chemical and physical interactions within a blast furnace
 - Determined process variables from the steel making process, metallurgy, and heat transfer
- C&I Design, Inc – Intern.....**May to Aug, of 2014 – 2016**
 - Utilized AutoCAD for drafting and editing red marks on architectural plans.

Leadership Experience:

- MSE Graduate Student Association – Purdue.....*Aug. 2020 – Mar. 2021*
 - Served as secretary on the executive board and aided in organizing events for the Purdue MSE department pertaining to Outreach, Diversity, Social Activities, Professional Development etc.
- Purdue Club Baseball.....*Sep. 2014 – May 2018*
 - President – Oversaw the Financial, Administrative, Service, and Athletic aspects of the club.
- Pi Kappa Alpha Fraternity.....*Jan. 2015 – May 2018*
 - Philanthropy and Service Chair – Organized and promoted various service/philanthropy events.
- Purdue Convocations Network.....*Aug 2014 – Aug 2015*

Teaching Experience:

- MSE 230 – Structure and Properties of Materials: Teaching Assistant – Purdue University.....*Spring 2020*
 - Lectured weekly on various topics related to the fundamentals of Materials Engineering to classes of ~35 undergraduate students.
 - Designed and administered weekly quiz testing course topics and held weekly office hours.
 - Aided in the transitioning from in-person to virtual teaching due to the spread of COVID-19.
- MSE 548 - Deposition Processing of Thin Films & Coatings – Purdue University.....*Fall semester 2019 & 2021*
 - Conducted lab demonstrations of various thin film processing and characterization tools

Honors and Professional Activities:

- The Minerals, Metals & Materials Society.....*Aug. 2023 - Present*
- Bisland Dissertation Fellowship.....*Aug. 2022 – May 2023*
 - This provides support for outstanding PhD candidates in their final year of their doctoral degree completion, which allows exceptional candidates to focus on finishing their dissertation.
- Purdue University Material Advantage.....*Aug 2015 – May 2023*
- Seagle Family Scholarship.....*Aug. 2016 - May 2018*
- Alpha Lambda Delta Phi Eta Sigma Honors Society.....*Jan. 2015*

Publications

1. **N.A. Richter**, T. Niu, B. Yang, J.P. Barnard, Y.F. Zhang, T. Sun, J. Hoffman, H. Wang and X. Zhang. “*Significant texture and hardness improvement of TiN coatings using pulsed DC magnetron sputtering*”, (2023). **Applied Surface Science**, 635(30), 157709.
2. K. Xu, Z. Shang, X. Sheng, **N.A. Richter**, A. Shang, C. Shen, B. Yang, Y. Zhang, T. Niu, H. Wang and X. Zhang. “*Metastable phases in sputtered stoichiometric Co₃Al*”. (2024). **Scripta Materialia – Under review**,
3. **N.A. Richter**, B. Stegman, B. Yang, Z. Shang, A. Shang, T. Niu, X. Sheng, J. Lopez, H. Wang and X. Zhang. “*Micropillar compression study on the cellular precipitate structure in additively manufactured AlSi₇Mg_{0.6} alloys*”. **Drafting**.
4. **N.A. Richter**, X. Sheng, B. Yang, B.T. Stegman, H. Wang, and X. Zhang, (2023). “*Assessing strain rate sensitivity of nanotwinned Al-Zr alloys through nanoindentation*”, **Crystals**, 13(2), 276.
5. Z. Shang, T. Sun, J. Ding, **N.A. Richter**, N.M. Heckman, B.C. White, B.L. Boyce, K. Hattar, H. Wang and X. Zhang. (2023) “*Gradient nanostructured steel with superior tensile plasticity*”, **Science Advances**.
6. X. Sheng, **N.A. Richter**, A.Y. Shang, H. Wang, and X. Zhang, (2023), “*Twin density and twin thickness evolution in sputtered Al-Mg alloys*”, **Journal of Applied Physics**, 133, 205301.
7. R.L. Paldi, M. Kalaswad, J. Lu, J.P. Barnard, **N.A. Richter**, M. Si, N.A. Bhatt, D. Peide, R. Sarma, A. Siddiqui, J. Huang, X. Zhang and H. Wang, (2023). “*ZnO-ferromagnetic metal vertically aligned nanocomposite thin films for magnetic, optical and acoustic metamaterials*”, **Nanoscale Advances**, 5, 247-254.
8. **N.A. Richter**, Y.F. Zhang, M. Gong, T. Niu, B. Yang, S. Xue, J. Wang, H. Wang and X. Zhang. (2022) “*Solute synergy induced impressive thermal stability of nanotwinned Al-Co-Zr alloys*”. **Materials Science and Engineering: A**, 862, 144477.
9. T. Niu, Y.F. Zhang, Z. He, T. Sun, **N.A. Richter**, H. Wang, and X. Zhang, (2022). “*Texture Development in Cu-Ag-Fe triphase immiscible nanocomposites with superior thermal stability*”, **Acta Materialia**, 244(1), 118545.
10. Y.F. Zhang, T. Niu, **N.A. Richter**, T. Sun, N. Li, H. Wang, and X. Zhang, (2022). “*Tribological behaviors of nanotwinned Al alloys*”, **Applied Surface Science**, 600, 154108.

11. **N.A. Richter**, M. Gong, Y.F. Zhang, Q. Li, T. Niu, J. Wang, H. Wang and X. Zhang. (2022). “Exploring deformation behavior of nanotwinned Al-Zr alloy via in-situ micropillar compression”. **Journal of Applied Physics**, 132, 065104
 - **Editor’s pick.**
12. **N.A. Richter**, Y.F. Zhang, D.Y. Xie, R. Su, Q. Li, S. Xue, T. Niu, J. Wang, H. Wang and X. Zhang. (2021). “Microstructural evolution of nanotwinned Al-Zr alloy with significant 9R phase”. **Materials Research Letters**, 9(2), 91-98.
13. B. Yang, Z. Shang, J. Ding, J. Lopez, W. Jarosinski, T. Sun, **N.A. Richter**, Y.F. Zhang, H. Wang and X. Zhang. (2021). “Investigation of strengthening mechanisms in additively manufactured Haynes 230 alloy”. **Acta Materialia**, 222(1), 117404.
14. M. Gong, W. Wu, D.Y. Xie, **N.A. Richter**, Q. Li, Y.F. Zhang, S. Xue, X. Zhang and J. Wang. (2021). “First-principles calculations for understanding microstructures and mechanical properties of co-sputtered Al alloys”. **Nanoscale**, 13(35), 14987-15001.
15. Q. Li, Z. Shang, X. Sun, C. Fan, R. Su, **N.A. Richter**, Z. Fan, Y.F. Zhang, S. Xue, H. Wang and X. Zhang. (2020). “High-strength and tunable plasticity in sputtered Al-Cr alloys with multistage phase transformations”. **International Journal of Plasticity**, 137, 102915.
16. Y.F. Zhang, R. Su, T. Niu, **N.A. Richter**, S. Xue, Q. Li, J. Ding, B. Yang, H. Wang, and X. Zhang. (2020). “Thermal stability and deformability of annealed nanotwinned Al/Ti multilayers”. **Scripta Materialia**, 186, 219-224.
17. Y.F. Zhang, R. Su, D.Y. Xie., T. Niu, S. Xue, Q. Li, Z. Shang, J. Ding, **N.A. Richter**, J. Wang, H. Wang, and X. Zhang. (2020). “Design of super-strong and thermally stable nanotwinned Al alloys via solute synergy”. **Nanoscale**, 12(39), 20491-20505.
18. Y.F. Zhang, Q. Li, M. Gong, S. Xue, J. Ding, J. Li, J. Cho, T. Niu, R. Su, **N.A. Richter**, H. Wang, J. Wang, and X. Zhang. (2020). “Deformation behavior and phase transformation of nanotwinned Al/Ti multilayers”. **Applied Surface Science**. 527(15), 146776.

Review Articles

1. Q. Li, S. Xue, C. Fan, **N.A. Richter**, Y.F. Zhang, Y. Chen, H. Wang and X. Zhang. (2021). “Epitaxial nanotwinned metals and alloys: synthesis-twin structure–property relations”. **CrystEngComm**, 23(38), 6637-6649.

Patents

1. Q. Li, X. Zhang, Y.F. Zhang, S. Xue, H. Wang, and **N.A. Richter**. “Aluminum alloy coatings with high strength and high thermal stability and method of making the same”. U.S. Patent Application No. 17/106,964.

Conferences and Talks

- Oral Presentations:
 1. “Solute Synergy Improved Thermal Stability of Nanotwinned Al Alloys” by **N.A. Richter**, Y.F. Zhang, M. Gong, T. Niu, B. Yang, S. Xue, J. Wang and X. Zhang in the symposium “Development in Light Weight Alloys and Composites – Microstructure and Mechanical Properties”. 2022, MS&T Fall.
 2. “Heavy Ion Irradiation Response of an Additively Manufactured 316L Stainless Steel” by **N.A. Richter**, X. Zhang, Z. Shang, C. Fan, L. Shao, T. Voisin, Y. Wang in the symposium “Tackling Structural Materials Challenges for Advanced Nuclear Reactors”. 2022, MS&T Fall.
 - Invited talk guest speaker on behalf of X. Zhang
 3. “In Situ Studies on Room Temperature Deformability of Nanolaminates and Nanocrystalline Intermetallics” by **N.A. Richter**, X. Zhang, R. Su, D. Neffati, T. Kulkarni in the symposium “Integration between Modeling and Experiments for Crystalline Metals: From Atomistic to Macroscopic Scales IV”. 2022, MS&T Fall.
 - Invited talk guest speaker on behalf of X. Zhang
 4. “Microstructural evolution of nanotwinned Al-Zr alloy with significant 9R phase stabilization” by **N.A. Richter**, Y.F. Zhang, R. Su, T. Niu, Q. Li, S. Xue, H. Wang and X. Zhang in the symposium “Defect and Phase Transformation Pathway Engineering for Desired Microstructures: Experiment and Characterization”. 2021, TMS Virtual
 5. “Breaking Down Geographical Barriers: Virtual and Non-Standard Recruiting Efforts for Graduate Engineering at Purdue” by B. Hamilton, B. Stegman, R. Son, J.C. Verduzco Gastelum, R. Paldi, J. Gohl,

N.A. Richter in the symposium “Diversity in the Minerals, Metals, and Materials Professions 4 (DMMM4)”. 2022, TMS Annual Meeting.

6. “*Thermal stability and mechanical behavior of immiscible Cu-Ag/Fe triphase multilayers with triple junctions*” by T. Niu, Y.F. Zhang, J. Cho, **N.A. Richter**, T. Sun, H. Wang, and X. Zhang in the symposium “Grain Boundaries and Interfaces: Metastability, Disorder, and Non-Equilibrium Behavior”. 2022, TMS Annual Meeting.
7. “*Deformation behavior and phase transformation of nanotwinned Al/Ti multilayers*” by Y.F. Zhang, Q. Li, M. Gong, S. Xue, J. Ding, J. Cho, T. Niu, R. Su, **N.A. Richter**, H. Wang, J. Wang and X. Zhang in the symposium “Advanced Characterization Techniques for Quantifying and Modeling Deformation”. 2021, TMS Virtual.

- Poster Presentations:

1. “*Significant texture and wear resistance improvement of TiN coatings using pulsed DC magnetron sputtering*” by **N.A. Richter**, B. Yang, J. Barnard, Y. Niu, Y. Zhang, D. Shaw, H. Wang, X. Zhang in the session “Advanced Surface Engineering”. 2022, AVS 68.
2. “*Nucleation of Electrodeposited Pure Sn-Whiskers on a Cu Substrate by Blister Testing*” by **N.A. Richter**, X. Chen and J. Blendell in the Undergraduate Research Poster Competition, 2017 Materials Science & Technology, Pittsburgh
3. “*Well-aligned nanoprecipitates in Nickel alloy produced by direct metal laser sintering*” by B. Yang, Z. Shang, J. Ding, J. Lopez, W. Jarosinski, T. Sun, Y.F. Zhang, **N.A. Richter**, H. Wang and X. Zhang in the symposium “Additive Manufacturing: Solid-State Phase Transformations and Microstructural Evolution”. 2021, TMS Virtual