Resume'
Michael James Hoerner, Ph.D.
Sr. Metallurgical Advisor

Professional Summary:

Michael is the technical lead for the KnightHawk Engineering Materials Lab (KML). He recently defended his Ph.D. in Metallurgical and Materials Engineering at Colorado School of Mines. As the KML technical lead Michael is responsible for overseeing all materials investigations performed by KML and supporting the work of KnightHawk Engineering (KHE) when materials expertise is required. Michael's Ph.D. work focused on computational investigations of solute-grain boundary interactions in FCC Fe (austenite) at the atomic scale. This work was combined with coursework and teaching assistant assignments in the field of traditional physical metallurgy, including significant work in the areas of failure analysis, casting and forging, strengthening mechanisms, kinetics, and thermodynamics. His undergraduate degree was in Engineering Physics with a concentration in Micro and Nano-Technology. This combination of experience has provided Michael with a strong, multi-disciplinary background from which he can draw experience from multiple fields in order to solve complex problems.

Employment History:

2018 to Present: KnightHawk Engineering – Sr. Metallurgical Advisor

As the technical lead for KML, Michael is chiefly responsible for reviewing and approving all technical content that is produced by the lab. This includes overseeing metallurgical and materials failure analysis projects, designing and performing specialized testing, supporting KHE root cause failure analysis projects and fitness for service projects, and providing expert opinions on materials investigations for litigation.

2011-2018: Colorado School of Mines

During his Ph.D. at Colorado School of Mines, Michael developed a thesis research program to investigate solute drag on austenite grain boundaries in Fe using DFT and MD modeling to understand short-range atomic interactions. To communicate his work, the author prepared semi-annual technical research reports for industrial sponsors many of whom had no experience with atomistic modeling to convey an understanding of the results and the potential of modeling. In return, Michael received input on the project from industrial mentors interested in industrial application of results. Additionally, the author performed both TA and class work involving physical metallurgy, heat treating, foundry work, and mechanical testing using both servo-hydraulic and screw driven mechanical test frames. His exposure to the work of materials research was further broadened by attending semi-annual research meetings where results from a wide array of modern research techniques were presented. In his research, the author used novel analysis of the charge density to gain an understanding of the sub-atomic structures leading to solute interaction with grain boundaries (Bader analysis, molecular orbital and DOS analysis), and implemented multi-scale modeling using MD to generate grain boundary structures and DFT to determine solute interactions with grain boundaries. He then compared simulation results to literature data to provide validation and industrial relevance to his results. He collaborated with the Molecular Theory Group (MTG) to develop the Bondalyzer package for Tecplot360, allowing novel partitioning and study of the charge density.

Summer 2012: Sandia National Labs Visiting Summer Researcher

As a visiting summer researcher Michael developed an understanding of the requirements for performing rigorous MD and DFT simulations, and then used that understanding to perform initial investigations of solute energetic interaction with grain boundaries using VASP.

Summer 2010: National Nanotechnology Infrastructure Network Summer REU

Michael performed research on improving solar cell efficiency using photonic nanogrids. During this project, he spent significant time using a scanning electron microscope for imaging and electron beam lithography.

Colorado Center for Biorefining and Biofuels Summer REU

Michael performed research on the effect of vegetable oil on engine cylinder durability at the Engines and Energy Conversion Laboratory at Colorado State University.

Professional Registration:

Michael passed the Fundamentals of Engineering Exam in 2011 and is currently completing his time as an engineer under a registered professional engineer in order to qualify to take the PE exam.

Education: Colorado School of Mines, Golden, CO; PHDMME 2018
Rose-Hulman Institute of Technology, Terre Haute, IN; BSEP 2011

Professional Societies:

ASM – ASM International, member of ASM's AM&P Committee

Recent and Upcoming Presentations and Publications:

M. Hoerner, L. Robinson, P. Sheth, F. Martazavi, "The Root Cause of a Plant Fire: Bearing Defects and Pump Cavitation," MS&T19: Conference Proceedings: Unedited Section, September 29, 2019.

M. Hoerner, J. Speer, M. Eberhart, "Comparison of Ab-initio Solute-Boundary Binding Energies and Experimental Recrystallization Data in Austenite for Solute Nb and Other Elements," ISIJ International, Vol. 57 (10), 2017.

M. Hoerner, M. Eberhart, J. Speer, "Ab-initio Calculation of Solute Effects on Austenite Grain Boundary Properties in Steel," Proceedings of the 3rd World Congress on Integrated Computational Materials Engineering, May 31-June 4, 2015.

M. Hoerner, M. Eberhart, J. Speer, E. B. Damm, "The Structure Property Relationships Governing Solute-Boundary Binding Energies in Austenite," Proceedings of the International Conference on Solid-Solid Phase Transformations in Inorganic Materials 2015, June 28-July 3, 2015.

M. Hoerner, L. Robinson, P. Sheth, F. Martazavi, "The Root Cause of a Plant Fire: Bearing Defects and Pump Cavitation," Presented at: Materials Science and Technology 2019, September 29, 2019-October 3, 2019

M. Hoerner, M. Eberhart, J. Speer, “Ab-initio Calculation of Solute Effects on Austenite Grain Boundary Properties in Steel,” Presented at: 3rd World Congress on Integrated Computational Materials Engineering, June 1, 2015.

M. Hoerner, M. Eberhart, J. Speer, E. B. Damm, “Determination of the Structure Property Relationships Governing Solute-Boundary Binding Energies in Austenite Through Atomistic Modeling,” Poster presented at: International Conference on Solid-Solid Phase Transformations in Inorganic Materials 2015, June 30, 2015.