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Engineering & Scientific Consulting

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Professional Profile

Dr. Issahaq holds a Ph.D in Materials Engineering from Purdue University with expertise in machining-based deformation processing of ferrous and non-ferrous engineering metals. He has hands-on experience in CNC machining, metal forming operations, microstructural characterization, microscopic techniques (optical and scanning electron microscopy), mechanical and electrical conductivity testing, surface and defect metrology, and high-speed imaging and image processing.

In his Ph.D. thesis, Dr. Issahaq studied how large-strain deformation in a hybrid cutting-extrusion process influences material grain size and crystallographic texture, and, in turn, formability and electrical properties of the resulting metal strip. He established that the combination of fine grain size and unique crystallographic shear texture due to the controlled shear-deformation processing, enabled metal strip with enhanced strength and formability. He also developed a suite of in situ high-speed imaging techniques to characterize the deformation and temperature parameters in the process zone.

In his post-doctoral research position at Purdue, he was successful in exploiting changes in surface plasticity of metals induced by organic adsorbates to achieve order of magnitude improvements in cutting and shearing of highly strain-hardening metals. His work has contributed proof to support the hypothesis that the adsorbates effect a local ductile-to-brittle transition (DBT) that makes the cutting easier due to fracture-controlled chip formation.

Prior to graduate school, Dr. Issahaq worked in the mining and metals industry in Ghana, West Africa, in the roles of Mine Operations Superintendent at Maxmass Ltd., AngloGold Induaprim site and as a Drill and Blast Engineer at Goldfields Ghana Ltd., all located in the western region of Ghana. In these roles, he managed mine fleet dispatch operations, and supervised drilling and blasting operations.

Academic Credentials & Professional Honors

Ph.D., Materials Engineering, Purdue University, 2021

B.S., Mining Engineering, University of Mines and Technology, 2012

Prior Experience

Investigated the disruption of large-strain plastic deformation in metals due to adsorbed long-chain organic monolayers.

Reengineered multi-step, sheet metal fabrication processes into a single-step process by constrained deformation in a hybrid cutting-extrusion process.

Analyzed the root cause and suppression mechanisms of dual-scale flow instabilities in the cutting of highly strain hardening materials.

Professional Affiliations

American Society of Mechanical Engineers (ASME)

Association for Iron & Steel Technology, (AIST)

ASM International

The Minerals, Metals & Materials Society, (TMS)

American Ceramic Society, (ACerS)

National Society of Black Engineers, (NSBE)

Publications

M. N. Issahaq, A. Udupa, T. Sugihara, D.P Mohanty, J. Mann, K.P Trumble, S. Chandrasekar, R. M'Saoubi, 2022, Enhancing Surface Quality in Cutting of Gummy Metals Using Nanoscale Organic Films, CIRP Annals- Manufacturing Technology. <https://doi.org/10.1016/j.cirp.2022.04.078>.

M. N. Issahaq, S. Chandrasekar, K. P. Trumble, 2021, Single-Step Shear-Based Deformation Processing of Electrical Conductor Wires, ASME J. Manuf. Sci. Eng. 143, 051010; <https://doi.org/10.1115/1.4048984>

A.S. Hadi, B. E. Hill, M. N. Issahaq, 2021, Performance Characteristics of Custom Thermocouples for Specialized Applications, MDPI Crystals 2021, 11(4), 377; <https://doi.org/10.3390/cryst11040377>

N. Kedir, J. A Hernandez, M.N. Issahaq, et al, 2021, Effect of Laser Irradiation Time on the Surface Characteristics of a Carbon Fiber Composite, J. Laser Appl. 33, 042034; <https://doi.org/10.2351/7.0000392>

Presentations

M.N. Issahaq, A.R. Strayer, P.D. Brooke, J.A. Lemberg, E.R. Guyer. Muzzleloader Failure Analysis. 15th International Conference on Fracture, Atlanta, Georgia, 2023.

M.N Issahaq, K.P. Trumble (2020), Production of Commercially Pure Aluminum Strips via Single-Step, Shear-Based Techniques. The Minerals, Metals & Materials Society (TMS) Conference, San Diego, CA.

M.N Issahaq, K.P. Trumble (2019), Flow Instabilities in the cutting of Commercially Pure Aluminum Alloys. Poster Presentation, The Minerals, Metals & Materials Society (TMS) Conference, San Antonio, TX.

M.N Issahaq, K.P. Trumble (2017) "Shear-Based Processes for the Production of Strong Aluminum Electrical Conductors" Materials Science & Technology (MS &T) Conference, Pittsburgh, PA.

Project Experience

Investigated the disruption of large-strain plastic deformation in metals due to adsorbed long-chain organic monolayers.

Reengineered multi-step, sheet metal fabrication processes into a single-step process by constrained

deformation in a hybrid cutting-extrusion process.

Analyzed the root cause and suppression mechanisms of dual-scale flow instabilities in the cutting of highly strain hardening materials.

Peer Reviews

International Journal of Machine Tools and Manufacture