Hamad F. Al-Harbi

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EMPLOYMENT

- **Assistant Professor** Feb. 2014-present

Mechanical Engineering Department, King Saud University, Saudi Arabia

CURRENT FIELDS OF INTERESTS

- Crystal Plasticity, Texture Evolution, Finite Element Models, Multi-scale Models, Computational Mechanics and Materials Science.
- Characterization of Local Anisotropic Mechanical Behavior in Heterogeneous Materials using Spherical Nanoindentation.
- Microstructure Representation, Orientation Imaging Using SEM/EBSD, n-point Statistics, Microstructure Hulls, and Property Closures.

EDUCATION

Ph.D. Mechanical Engineering January 2014
Georgia Institute of Technology, Atlanta, Georgia

M.S. Materials Science and Engineering September 2009
Drexel University, Philadelphia, Pennsylvania

B.S. Mechanical Engineering 2001
King Abdulaziz University, Saudi Arabia

RESEARCH/ TEACHING EXPERIENCE

Research Assistant 2008-2013
Mechanical Engineering Dept., Georgia Institute of Technology, Atlanta, Georgia
Materials Science and Engineering Dept., Drexel University, Pennsylvania
Research Projects (supervised by Prof. Surya R. Kalidindi):

- Developing crystal plasticity based FE simulation tools using spectral databases.
- Extracting crystal-level slip hardening parameters in advanced high strength steels using electron microscopy technique and spherical nanoindentation.
- Multi-scale FE simulations using the newly developed mathematical scale-bridging (localization) framework, called Materials Knowledge System.

Teaching Assistant

- Materials Science Department, Drexel University Aug. 2008-Aug. 2009
  Courses: Processing Metallic Materials (MSE-366) and Applied Engineering Analytical & Numerical Methods III (MEM-593)

- Mechanical Engineering Department, King Saud University June 2006-Aug. 2007
  Courses: Processing of Engineering Materials (ME-355 & ME-356), Experimental Design (ME-508), and Engineering Drawing (ME-202).

INDUSTRY EXPERIENCE

Inspection Engineer May 2005-July 2006
Inspector throughout the construction of Khursania gas plant
Saudi Aramco, Saudi Arabia

- Responsiblities included: conducting field inspection of various stationary equipment including pipelines and pressure vessels and montioring Nondestructive testing (NDT) and welding activities on new installed piping and tanks.

Corrosion Engineer June 2003-April 2005
North-Ghawar Oil Producing Area
Saudi Aramco, Saudi Arabia

- Responsiblities included: monitoring corrosion protection systems on different gas oil sepearation plants and conducting fitness for service assessement of tanks and pipelines in North-Ghawar oil producing area.

Plant Engineer July 2002-May 2003
Shedgum Gas Oil Separation Plant (GOSP)
Saudi Aramco, Saudi Arabia

- Responsiblities included: preparing design packages for addressing plant malfunctions and troubleshooting plant shutdown.

Maintenance Engineer Aug. 2001-March 2002
Ibn Sina National Methanol Company
Saudi Basic Industries Corporation (SABIC), Saudi Arabia

- Responsiblities included: monitoring vibration in rotating equipment incluidng pumps and compressors as well as investigating Cathoid Protection (CP) system for underground piping.

SKILLS

Materials Characterization:

- Scanning Electron Microscopy (SEM), Orientation Imaging Microscopy using Electron Backscatter Diffraction (EBSD), and X-Ray Diffraction (XRD).
- Nanoindentation to measure local mechanical properties at the submicron scale.
- Sample preparation: Mechanical polishing, electro-polishing
- Thermo-mechanical processing, mechanical testing, and heat treatment

Programming/Software

- FORTRAN, Python, Perl, MATLAB, Maple, Mathematica, AutoCAD, SolidWorks.

Modeling/Simulations

- Finite Element software (ABAQUS, ANSYS, LSDYNA)
- Metal forming simulations (FORGE, DEFORM)
- Extensive knowledge of developing User Materials Subroutine (UMAT) for ABAQUS including elastic, plastic, and crystal plasticity constitutive equations.

Microstructure Representation/Quantification

- N-point correlations, texture analysis
- Generalized Spherical Harmonics (GSH)

Computational Mechanics

- Classical plasticity theories
- Crystal plasticity
- Composite theories

JOURNAL PUBLICATIONS

Al-Harbi, H.F. and S.R. Kalidindi, *Crystal plasticity finite element simulations of cubic polycrystalline materials using spectral databases. International Journal of Plasticity, accepted, 2014.*

Patel, D.K., **H.F. Al-Harbi**, and S.R. Kalidindi, *Extracting single crystal elastic constants from polycrystalline samples using spherical nanoindentation simulations*. Submitted to Acta Materialia.

Al-Harbi, H.F., G. Landi, and S.R. Kalidindi, *Multi-scale modeling of the elastic response of a structural component made from a composite material using the materials knowledge system.* Modelling and Simulation in Materials Science and Engineering, 2012. **20**(5).

Hamad F. Al-Harbi, Marko Knezevic, and Surya R. Kalidindi (2010). "Spectral Approaches for the Fast Computation of Yield Surfaces and First-Order Plastic Property Closures for Polycrystalline Materials with Cubic-Triclinic Textures." Computers, Materials, & Continua (CMC) **15**(2): 153-172.

Marko Knezevic, **Hamad F. Al-Harbi**, and Surya R. Kalidindi (2009). "Crystal plasticity simulations using discrete Fourier transform." Acta Materialia **57**(6): 1777-1784.

CONFERENCE PRESENTATIONS

Hamad F. Al-Harbi and Surya R. Kalidindi, " *New spectral crystal plasticity approach using Discrete Foruier Transforms*", Society of Engineering Science, 49th Annual Technical Meeting, October 10-12, 2012, Atlanta, Georgia.

Hamad F. Al-Harbi, Giacomo Landi, and Surya R. Kalidindi, "*Multi-scale modeling of the elastic response of a structural component made from a composite material using the materials knowledge system*", International Workshop *on* Computational Mechanics *of* Materials (IWCMM XXII), September 24-26, 2012, Baltimore, Maryland.

Hamad F. Al-Harbi, Josh Shaffer, Surya R. Kalidindi "*Crystal plasticity finite element simulations of cubic metals using spectral databases of DFTs*", TMS 2011, Feb. 27-March 03, 2011. San Diago, California.

Hamad F. Al-Harbi, Marko Knezevic, Surya R. Kalidindi "*Elastic-Plastic Closures for Polycrystalline Cubic-Triclinic Microstructures using Spectral Crystal Plasticity*", Materials Science & Technology Oct 25-29 2009, Pittsburgh, Pennsylvania.

MEMBERSHIPS

The Minerals, Metals and Materials Society (TMS), ASM International, The American Ceramic Society (ACers), Association for Iron and Steel Technology (AIST), American Association for Advancement of Science (AAAS)

REFERENCES

Surya Kalidindi, Ph.D. (Advisor)
Woodruff School of Mechanical Engineering
Georgia Institute of Technology
Bunger Henry, Room 192
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