

Mohsen Dadfarnia, Ph.D.

Seattle University, Mechanical Engineering Department
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EDUCATION

University of Illinois, Urbana-Champaign, IL

PhD in Mechanical Engineering, GPA: 4.0 / 4.0

Mar. 2009

Dissertation: Micromechanics of Hydrogen-Induced Crack Initiation in Pipeline Steels and Subcritical Crack Growth

Clemson University, Clemson, SC

Master of Science in Mechanical Eng

- Investigation of hydrogen embrittlement of a lath martensitic steel using

- Solid Mechanics II (TAM552, graduate level) Springs of 2010, 2011, 2012, 2013, 2014, 2015
- Fracture Mechanics (TAM555, graduate level) Falls of 2010 and 2014
 - o Jointly taught courses with Prof. Sofronis

Teaching Assistant

Department of Mechanical Science and Engineering, University of Illinois

- Mechanical Design II (ME371, undergraduate class) Spring 2004
 - o Instructed two sections of computer labs and evaluated/corrected lab reports
- Modeling and Analysis of Dynamic Systems (ME340, undergraduate class) Fall 2003
 - o Instructed a lab section of the class and graded lab reports
 - o Organized class hours for students and prepared homework solutions

Teaching Assistant

Department of Mechanical Engineering, Clemson University

- Calculus of One Variable (introductory undergraduate class) Summer 2003
 - o Held problem sessions and helped instructor with in-class student assignments/discussions
- Advanced Control Engineering (graduate level) Spring 2003
 - o Prepared homework solutions and graded homework
- Introduction to Dynamic Systems (undergraduate class) Spring 2003
 - o Prepared homework solutions and graded homework

Teaching Assistant

Department of Mechanical Engineering, Sharif University of Technology

- Machine Design II (undergraduate class) Spring 1998
 - o Held problem sessions and supervised students on their course projects
- Continuum Mechanics (graduate level) Fall 1997
 - o Graded homework and held office hours

Advising Experience

Co-advised students in Professor Sofronis group

- Kshitij Vijayvargia (Ph.D. student) Aug. 2019 – present
- Zahra Hosseini (Ph.D. student) Aug. 2020 – Feb. 2022
- Rupesh K. Mahendran (M.S. student) Aug. 2018 – Aug. 2020
- Zahra Hosseini (Ph.D. student) Aug. 2013 – May 2020
- John W. Sanders (Ph.D. student) Aug. 2013 – June 2017
- Will Enowmbitang (undergraduate) Spring 2017
- Ziwei Che (M.S. student) Aug. 2015 – Aug. 2017
- Rah He (M.S. student) Spring 2015
- Jason J. Chan (M.S. student) Jan. 2010 – Dec. 2011
- Kuntay Kucukal (M.S. student) Aug. 2009 – Aug. 2011
- Gregory J. Schebler (M.S. student) Jan. 2010 – Dec. 2010
 - o Taught use of ABAQUS software, formulation of constitutive material models based on finite-deformation finite element and analysis, and writing user material subroutines (UMAT)
 - o Helped the students with code writing
 - o Guided the students in their research

COMPUTER SKILLS

Software packages: Abaqus, ANSYS, SolidWorks, Matlab/Simulink, Maple, and Mathematica

Programming languages: Fortran, C++, and Python

Platforms: Windows and UNIX

Office software: Microsoft Office (Word, PowerPoint,

INDUSTRIAL EXPERIENCE

Team member in the following projects

Evolution of stress and strains in hydrogen sensor

Summer of 2019

- Supported by Nagano Keiki Co., LTD

- Performed numerical simulation for determining the impact of pressure sensor exposure on strains developed on the pressure sensor diaphragm

A combined micromechanics/materials-science approach to understanding hydrogen attack July 2015 – July 2017

- Supported by BP-ICAM

- Reviewed the existing literature on high temperature hydrogen attack (HTHA)
- Proposed a physically-based lifetime prediction model for failure of carbon steels under HTHA

Evaluating hydrogen embrittlement of line pipe steels

Sep. 2015 – Sep. 2016

- Supported by Southern California Gas (SoCalGas) Company

- Analyzed growth of axial crack under cyclic loading in pipelines due to random fluctuation of internal pressure
- Evaluated the fracture resistance of the SoCalGas line pipes for transporting a mixture of hydrogen and natural gas up to 5% hydrogen concentration

Irradiation Effects on Material Properties for 304L Stainless Steel Base Metal and Welds

Sep. 2011 – Sep. 2012

- Supported by Canadian Nuclear Safety Commission

- Surveyed open literature for the effect of neutron irradiation on mechanical properties of 304 and 316 steels
- Identified the pieces of information to allow for the assessment of suitability of data for the estimation of the end-of-life properties of CANDU calandria vessels after 60 years in service.

Susceptibility of the Kinder-Morgan Pipeline to Hydrogen Embrittlement

Aug. 2007 – Apr. 2008

- Supported by Kinder-Morgan

- Modeled the interaction of hydrogen transient diffusion with the material elastoplastic deformation induced by the pipeline gas pressure
- Investigated hydrogen accumulation close to notch or crack on inside or outside surfaces of a pipeline

Design engineer at the Research Center of Iran-Khodro

Tehran, Iran

Company

Sep. 2000 – Jan. 2001

- Used MSC/Patran and MSC/Nastran software to analyze structural components of car body
- Analyzed the floor plate of a car for vibration absorber placement

Design Review Engineer at Farab Company (www.farab.com)

Tehran, Iran

Sep. 1999 – Sep. 2000

- Reviewed the analysis of bus-duct structure and carrier
- Examined the design of structural components of power plants
- Conducted numerical analysis of butterfly valves to check their durability using ANSYS software

Internship at Iran Heavy Die Manufacturing Company

Tehran, Iran

Summer 1996

- Worked with Japanese Standard in die design and drawing
- Designed and manufactured a rail that allows a drilling machine to work at different positions

Internship at Iran Alloy Steel Company (www.iasco.ir)

Yazd, Iran

Summer 1995

- Learned pneumatic, hydraulic circuits, and elements design and illustration
- Evaluated the design and operation of cutting and rolling machines

PROFESIONAL SERVICE

Journal Reviewer

- Corrosion Science
- Engineering Fracture Mechanics
- Engineering Fracture Analysis
- International @kfa@kh@s

Martin, M.L., **Dadfarnia, M.**, Nagao, A., Wang, S., Sofronis, P., 2019, “Enumeration of the hydrogen-enhanced localized plasticity mechanism for hydrogen embrittlement in structural materials,” *Acta Materialia*, 165, pp. 734-750. (DOI: 10.1016/j.actamat.2018.12.014)

Hosseini, Z.S., **Dadfarnia, M.**, Somerday, B.P., Sofronis, P., Ritchie, R.O., 2018, “On the Theoretical Modeling of Fatigue Crack Growth,” *Journal of the Mechanics and Physics of Solids*, 121, pp. 341-362. (DOI: 10.1016/j.jmps.2018.07.026)

Nagao, A., **Dadfarnia, M.**, Somerday, B.P., Sofronis, P., and Ritchie, R.O., 2018, “Hydroge

Dadfarnia, M., Somerday, B.P., Sofronis, P.

Environments, B. P. Somerday, and P. Sofronis, eds., ASME Press, New York, NY, Proceedings of the 2016 International Hydrogen Conference, Grand Teton National Park, Wyoming, September 11-14, 2016, pp. 71-80.

Nagao, A., Wang, S., Nygren, K.E., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2017, "Microstructural

Dadfarnia, M., Sofronis, P., Robertson, I.M., Somerday, B.P., Muralidharan, G., and Stalheim, D., 2007, "Numerical Simulation of Hydrogen Transport at a Crack Tip in a Pipeline steel," *Proceedings of the 6th*

“A Methodology for Studying Hydrogen Embrittlement in a Steel Pipeline”, *45th Annual Technical Meeting, Society of Engineering Science (SES 2008)*, Urbana, Illinois, October 12-15, 2008.

“Modeling Hydrogen-Induced Sustained-load Cracking by Intergranular Failure”, *2008 International Hydrogen Conference: Effect of Hydrogen on Materials*, Grand Teton National Park, Wyoming, September 7-10, 2008.

“Hydrogen/Plasticity Interaction at Internal Cracks in Pipeline Steels”, *7th International ASTM/ESIS Symposium on Fatigue and Fracture*, Tampa, Florida, November 14-16, 2007.

“Micromechanics of Hydrogen Transport and Embrittlement in Pipeline Steel” *International Mechanical Engineering Congress and Exposition (IMECE 2006)*, Chicago, Illinois, November 5-10, 2006.

“A Reduced-order Observer based Piezoelectric Control of Flexible Cartesian Robot Manipulator,” *International Mechanical Engineering Congress and Exposition (IMECE 2002)*, New Orleans, Louisiana, November 17-22, 2002.

Reports:

Dadfarnia, M. and Sofronis, P. 2016, “Assessment of Resistance of Line Pipe Steels to Hydrogen Embrittlement” Report for Southern California Gas (SoCalGas) Company

Sofronis, P., Dadfarnia, M., and Martin, M.L., 2016, “Critical Review of High Temperature Hydrogen Attack in Carbon Steels” Report for BP-ICAM Project

Dadfarnia, M., Sofronis, P., and Robertson, I. M., 2012, “Irradiation Effects on Material Properties for 304L Stainless Steel Base Metal and Welds