

# Mohsen Dadfarnia, Ph.D.

Seattle University, Mechanical Engineering Department  
901 12th Avenue, Seattle, WA 98122

**Email:** dadfarniamoh@seattleu.edu

**Phone:** (206) 296-6941

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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 Engineering, GPA: 4.0 / 4.0**

Aug. 2003

**Thesis:** Lyapunov-Based Piezoelectric Control of Hybrid Flexible Structures

**Sharif University of Technology, Tehran, Iran**

**Master of Science in Applied Mechanics, GPA: 18.18 / 20.00**

Jan. 1999

**Thesis:** Nonlinear Forced Vibration of Generally Laminated Composite Beams

**Bachelor of Science in Mechanical Engineering, GPA: 18.23 / 20.00 (First rank)**

Sep. 1996

**Senior Project:** Optimization of Spatial Truss by Nonlinear Programming

## RESEARCH INTERESTS

Mechanics of materials, material modeling, computational mechanics, hydrogen embrittlement, environmental degradation

## ACADEMIC EXPERIENCE

### Research Experience

#### **Current Research Activities**

- Studying high temperature hydrogen attack of steels  
In collaboration with Prof. Sofronis (UIUC) and Prof. Kubota (Kyushu University)
- Understanding hydrogen effect on cyclic deformation  
In collaboration with Prof. Sofronis, Dr. Somerday (UIUC), Prof. Kubota (Kyushu University), and Dr. Nagao
- Investigating effect of hydrogen on creep deformation  
In collaboration with Prof. Sofronis, Dr. Somerday (UIUC), and Prof. Kubota (Kyushu University)
- Analyzing hydrogen embrittlement of steels in hydrogen gas with low CO concentration  
In collaboration with Prof. Sofronis (UIUC), Profs. Kubota and Staykov (Kyushu University)
- Developing a microstructurally informed constitutive model for austenitic steels in the presence of hydrogen  
In collaboration with Prof. Sofronis and Dr. Somerday (UIUC)
- Understanding oxygen electrode/electrolyte interface degradation in Solid oxide electrolysis cells  
In collaboration with Prof. Sofronis (UIUC)

**WPI Visiting Assistant Professor, I2CNER (Kyushu University)**

Aug. 2020 – present

**Research Scientist**

May 2014 – Aug. 2018

**Department of Mechanical Science and Engineering, University of Illinois**

- Study of high temperature hydrogen attack in steels
- Administration of projects on hydrogen effects on mechanical properties of materials in Hydrogen Material Compatibility division in International Institute for Carbon Neutral Energy Research (I2CNER)

- Investigation of hydrogen embrittlement of a lath martensitic steel using statistical micromechanical modeling
- Study of hydrogen uptake, bulk diffusion, and interaction with material elastoplasticity
- Development of a model for hydrogen transport in materials accounting for dislocation mode of transport
- Supervision of graduate students in Professor Sofronis group

**Post-Doctoral Research Associate**

Mar. 2009 – May 2014

**Department of Mechanical Science and Engineering, University of Illinois**

- Simulation of subcritical crack propagation and arrest based on critical hydrogen concentration/opening stress interaction
- Investigation of the interplay between multiple traps and their effect on hydrogen transport
- Modeling of competition between dislocation emission and brittle intergranular fracture at incipient microcrack using dislocation dynamics simulation
- Analysis of effects of hydrogen on crystalline metals using crystal plasticity model
- Modeling of material degradation under high temperature corrosive environment
- Study of the environmental similitude between the laboratory fracture specimen and real-life hydrogen gas pipeline
- Development of constitutive model for nanolayered composite materials under high strain rate
- Study of irradiation effects on material properties for 304L stainless steel base metal and welds
- Supervision of graduate students in Professor Sofronis group
- NSF proposal entitled: “Incipient microcracks: Fracture by decohesion vs. blunting” (Co-author)

**Research Assistant**

Jan. 2005 – Mar. 2009

**Department of Mechanical Science and Engineering, University of Illinois**

- Simulation of hydrogen diffusion coupled with large-strain elastoplastic deformation in pipeline steels
- Study of micromechanics of helium bubble growth in material tritides
- Identification of microstructural characteristic length for fracture of IN903 alloy in hydrogen gas environment
- Simulation of crack initiation and propagation in pipeline steels exposed to high pressure hydrogen gas (based on the thermodynamics of hydrogen-induced decohesion and hydrogen-assisted ductile processes)

**Research Assistant**

Jan. 2001 – Aug. 2003

**Department of Mechanical Engineering, Clemson University**

- Modeling of PZT patch actuator on a beam
- Design and implementation of an observer-based piezoelectric controller for a flexible robot
- Development of a new Lyapunov-based piezoelectric controller for a flexible robot

**Research Assistant**

Sep. 1997 – Jan. 1999

**Department of Mechanical Engineering, Sharif University of Technology**

- Development of a new theory for vibration of composite beams
- Formulations of 2D elasticity model for composite beams
- Performance of 3D vibrational analysis of composite beams using ANSYS Software

**Teaching Experience**

**Instructor**

**Department of Mechanical Engineering, Seattle University (Quarter system)**

- Advanced Computational Methods (MEGR5910, graduate level) Fall of 2021
- Advanced Engineering Methods (MEGR5210, graduate level) Springs of 2019 – 2021
- Engineering Project I/II (MEGR5990/5991, graduate level) 2019 – 2022
- Engineering Methods (MEGR2810, undergraduate) Falls of 2018, 2020, Springs of 2019 – 2022
- Machine Design I (MEGR3710, undergraduate) Winters of 2019 – 2022
- Machine Design II (MEGR4720, undergraduate) Fall of 2021
- Machine Shop (MEGR1060, undergraduate) Falls of 2018, 2019, Winters of 2019, 2020, Springs of 2019, 2022

**Instructor**

**Department of Mechanical Science and Engineering, University of Illinois**

- Solid Mechanics I (TAM551, graduate level) Falls of 2009, 2011, 2012, 2013

- Solid Mechanics II (TAM552, graduate level) Springs of 2010, 2011, 2012, 2013, 2014, 2015
- Fracture Mechanics (TAM555, graduate level) Falls of 2010 and 2014
  - 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
  - Instructed two sections of computer labs and evaluated/corrected lab reports
- Modeling and Analysis of Dynamic Systems (ME340, undergraduate class) Fall 2003
  - Instructed a lab section of the class and graded lab reports
  - 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
  - Held problem sessions and helped instructor with in-class student assignments/discussions
- Advanced Control Engineering (graduate level) Spring 2003
  - Prepared homework solutions and graded homework
- Introduction to Dynamic Systems (undergraduate class) Spring 2003
  - Prepared homework solutions and graded homework

### **Teaching Assistant**

#### **Department of Mechanical Engineering, Sharif University of Technology**

- Machine Design II (undergraduate class) Spring 1998
  - Held problem sessions and supervised students on their course projects
- Continuum Mechanics (graduate level) Fall 1997
  - 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
  - Taught use of ABAQUS software, formulation of constitutive material models based on finite-deformation finite element and analysis, and writing user material subroutines (UMAT)
  - Helped the students with code writing
  - 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, and Excel)

## **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](http://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

- Worked with Japanese Standard in die design and drawing

Summer 1996

- Designed and manufactured a rail that allows a drilling machine to work at different positions

### **Internship at Iran Alloy Steel Company ([www.iasco.ir](http://www.iasco.ir))**

Yazd, Iran

- Learned pneumatic, hydraulic circuits, and elements design and illustration

Summer 1995

- Evaluated the design and operation of cutting and rolling machines

## **PROFESIONAL SERVICE**

### **Journal Reviewer**

- Corrosion Science
- Engineering Fracture Mechanics
- Engineering Fracture Analysis
- International Journal of Control
- International Journal of Fracture
- Journal of Materials Engineering and Performance
- Journal of Phase Equilibria and Diffusion
- Journal of Strain Analysis for Engineering Design
- Journal of Testing and Evaluation
- Metallurgical and Materials Transactions A

- International Journal of Hydrogen Energy
- International Journal of Solids and Structures
- Journal of Applied Mechanics
- Journal of ASTM International
- Journal of the Mechanics and Physics of Solids
- Materials
- Materials Science & Engineering A
- Physical Review Letters & Physical Review B
- Thin Solid Films

### **Conference Reviewer**

- 2012 International Hydrogen Conference: Effect of Hydrogen on Materials, September 9-12, 2012, Grand Teton National Park, Wyoming, USA
- 2008 International Hydrogen Conference: Effect of Hydrogen on Materials, September 7-10, 2008, Grand Teton National Park, Wyoming, USA
- 8<sup>th</sup> International Pipeline Conference (IPC2010), September 27 - October 1, 2010, Calgary, Alberta, Canada
- 2003 International Mechanical Engineering Congress and Exposition (IMECE'03), ASME Dynamic Systems and Control Division, November 15-21, 2003, Washington, DC, USA

### **PROFESIONAL AFFILIATIONS**

- Member, American Society of Mechanical Engineers (**ASME**)
- Member, The Minerals, Metals & Materials Society (**TMS**)

### **PUBLICATIONS AND PRESENTATIONS**

#### **Book Chapter:**

Nagao, A., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2016, "Hydrogen Embrittlement: Mechanisms", *Encyclopedia of Iron, Steel, and Their Alloys*. Taylor and Francis: New York, pp. 1768-1784. (10.1081/E-EISA-120049717)

**Dadfarnia, M.**, Sofronis, P., Somerday, B.P., Balch, D.K., and Schembri, P., 2012, "Degradation Models for Hydrogen Embrittlement", *Gaseous hydrogen embrittlement of materials in energy technologies*, R. P. Gangloff and B. P. Somerday, eds., Volume 2, Woodhead Publishing. pp. 326-377.

#### **Journal Papers:**

Sanders, J.W., Jamshidi, Ni., Jamshidi, Ne., **Dadfarnia, M.**, Subramanian, S., Sehitoglu, H., Stubbins, J., Sofronis, P., 2022, "Effects of Diffusion and Primary Creep on Intergranular Cavitation at High Temperatures," *International Journal of Fracture*. (DOI: 10.1007/s10704-022-00640-4)

Takazaki, D., Tsuchiyama, T., Komoda, R., **Dadfarnia, M.**, Somerday, B.P., Sofronis, P., Kubota, M., 2021, "Effect of Hydrogen on Creep Properties of SUS304 Austenitic Stainless Steel," *Corrosion* 77(3), pp. 256-265. (DOI: 10.5006/3678)

Hosseini Z.S., **Dadfarnia, M.**, Nagao, A., Kubota, M., Somerday, B.P., Ritchie, R.O., Sofronis, P., 2021, "Modeling the hydrogen effect on the constitutive response of a low carbon steel in cyclic loading," *ASME Journal of Applied Mechanics* 88(3), pp. 031001:1-14. (DOI: 10.1115/1.4049076)

Sanders, J.W., **Dadfarnia, M.**, Sehitoglu, H., Stubbins, J., Sofronis, P., 2020, "On the Stress Field Ahead of a Stationary Crack Tip During the Transition from Primary to Secondary Creep," *International Journal of Solids and Structures*, 193-194, pp. 455-473. (DOI: 10.1016/j.ijsolstr.2020.02.040)

**Dadfarnia, M.**, Martin, M.L., Moore, D.E., Orwig, S.E., Sofronis, P., 2019, "A Model for High Temperature Hydrogen Attack in Carbon Steels under Constrained Void Growth," *International Journal of Fracture*, 219, pp. 1-17. (DOI: 10.1007/s10704-019-00376-8)

**Dadfarnia, M.**, Sofronis, P., Brouwer, J., Sosa, S., 2019, "Assessment of the Resistance of Natural Gas Line Pipe Steels to Hydrogen Embrittlement," *International Journal of Hydrogen Energy*, 44(21), pp.10808-10822. (DOI: 10.1016/j.ijhydene.2019.02.216)

- 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, "Hydrogen-Enhanced-Plasticity Mediated Decohesion for Hydrogen-Induced Intergranular and 'Quasi-Cleavage' Fracture of Lath Martensitic Steels," *Journal of the Mechanics and Physics of Solids*, 112, pp. 403-430. (DOI: 10.1016/j.jmps.2017.12.016)
- Martin, M.L., **Dadfarnia, M.**, Orwig, S., Moore, D., and Sofronis, P., 2017, "A Microstructure-Based Mechanism of Cracking in High Temperature Hydrogen Attack," *Acta Materialia*, 140, pp. 300-304. (DOI: 10.1016/j.actamat.2017.08.051)
- Sanders, J.W., **Dadfarnia, M.**, Stubbins, J.F., and Sofronis, P., 2017, "On the Fracture of High Temperature Alloys by Creep Cavitation under Uniaxial or Biaxial Stress States," *Journal of the Mechanics and Physics of Solids*, 98, pp. 49-62. (DOI: 10.1016/j.jmps.2016.05.019)
- Dadfarnia, M.**, Nagao, A., Wang, S., Martin, M.L., Somerday, B.P., and Sofronis, P., 2015, "Recent Advances on Hydrogen Embrittlement of Structural Materials," *International Journal of Fracture*, 196(1-2), pp. 223-243. (DOI: 10.1007/s10704-015-0068-4)
- Dadfarnia, M.**, Martin, M.L., Nagao, A., Sofronis, P., and Robertson, I.M., 2015, "Modeling Hydrogen Transport by Dislocations," *Journal of the Mechanics and Physics of Solids*, 78, pp. 511-525. (DOI: 10.1016/j.jmps.2015.03.002)
- Dadfarnia, M.**, Somerday, B.P., Schembri, P.E., Sofronis, P., Foulk, J.W., III, Nibur, K. A., and Balch, D. K., 2014, "On Modeling Hydrogen Induced Crack Propagation Under Sustained Load," *JOM*, 66(8), pp. 1390-1398. (DOI: 10.1007/s11837-014-1050-8)
- Nagao, A., Martin, M.L., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2014, "The Effect of Nanosized (Ti,Mo)C Precipitates on Hydrogen Embrittlement of Tempered Lath Martensitic Steel," *Acta Materialia*, 74(1), pp. 244-254. (DOI: 10.1016/j.actamat.2014.04.051)
- Nibur, K.A., Somerday, B.P., San Marchi, C., Foulk, J.W., III, **Dadfarnia, M.**, and Sofronis, P., 2013, "The Relationship Between Crack-tip Strain and Subcritical Cracking Thresholds for Steels in High-pressure Hydrogen Gas," *Metallurgical and Materials Transactions A*, 44(1), pp. 248-269. (DOI: 10.1007/s11661-012-1400-5)
- Nagao, A., Smith, C.D., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2012, "The Role of Hydrogen in Hydrogen Embrittlement Fracture of Lath Martensitic Steel," *Acta Materialia*, 60(13-14), pp. 5182-5189. (DOI: 10.1016/j.actamat.2012.06.040)
- Briceño, M., Fenske, J., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2011, "Effect of Ion Irradiation-Produced Defects on the Mobility of Dislocations in 304 Stainless Steel," *Journal of Nuclear Materials*, 409(1), pp. 18-26. (DOI: 10.1016/j.jnucmat.2010.12.026)
- Dadfarnia, M.**, Sofronis, P., and Thirumalai, N.S., 2011, "Hydrogen Interaction with Multiple Traps: Can It be Used to Mitigate Embrittlement?" *International Journal of Hydrogen Energy*, 36(16), pp. 10141-10148. (DOI: 10.1016/j.ijhydene.2011.05.027)
- Dadfarnia, M.**, Sofronis, P., Somerday, B.P., Balch, D.K., Schembri, P., and Melcher, R.J., 2011, "On the Environmental Similitude for Fracture in the SENT Specimen and a Cracked Hydrogen Gas Pipeline", *Engineering Fracture Mechanics*, 78(12), pp. 2429-2438. (DOI:10.1016/j.engfracmech.2011.06.002)
- Dadfarnia, M.**, Novak, P., Ahn, D.C., Liu, J.B., Sofronis, Johnson, D.D., and Robertson, I.M., 2010, "Recent Advances in the Study of Structural Materials Compatibility with Hydrogen," *Advanced Materials*, 22(10), pp. 1128-1135. (DOI: 10.1002/adma.200904354)
- Somerday, B.P., Balch, D.K., **Dadfarnia, M.**, Nibur, K.A., Cadden, C.H., and Sofronis, P., 2009, "Hydrogen-Assisted Crack Propagation in Austenitic Stainless Steel Fusion Welds," *Materials and Metallurgical Transactions*, 40(10), pp. 2350-2362. (DOI: 10.1007/s11661-009-9922-1)

**Dadfarnia, M.**, Somerday, B.P., Sofronis, P., Robertson, I.M., and Stalheim, D., 2009, "Interaction of Hydrogen Transport and Material Elastoplasticity in Pipeline Steels," *Journal of Pressure Vessel and Technology, Transactions of the ASME*, 131, 041404:1-13. (DOI: 10.1115/1.3027497)

**Dadfarnia, M.**, Sofronis, P., Somerday, B.P., and Robertson, I.M., 2008, "On the Small Scale Character of the Stress and Hydrogen Concentration Fields at the Tip of an Axial Crack in Steel Pipeline: Effect of Hydrogen-Induced Softening on Void Growth," *International Journal of Materials Research*, 99(5), pp. 557-570. (DOI: 10.3139/146.101674)

**Dadfarnia, M.**, Sofronis, P., Somerday, B.P., and Robertson, I.M., 2008, "Hydrogen/Plasticity Interaction at an Axial Crack in Pipeline Steel," *Journal of ASTM International*, 5(6), Paper ID JAI101531, www.astm.org. (DOI: 10.1520/JAI101531)

**Dadfarnia, M.**, Jalili, N., and Esmailzadeh, E., 2005, "A Comparative Study of the Galerkin Approximation Utilized in Timoshenko Beam Theory," *Journal of Sound and Vibration*, 280(3-5), pp. 1132-1142.

**Dadfarnia, M.**, Jalili, N., Xian, B., and Dawson, D.M., 2004, "An Investigation of Damping Mechanisms in Translational Euler-Bernoulli Beams using a Lyapunov-Based Stability Approach," *Journal of Vibration and Control*, 10(7), pp. 933-961.

**Dadfarnia, M.**, Jalili, N., Xian, B., and Dawson, D.M., 2004, "A Lyapunov-Based Piezoelectric Controller for Flexible Cartesian Robot Manipulators," *Journal of Dynamic Systems, Measurement and Control, Transactions of the ASME*, 126(2), pp. 347-358.

Jalili, N., **Dadfarnia, M.**, and Dawson, D.M., 2004, "A Fresh Insight into the Microcantilever-Sample Interaction Problem in Non-Contact Atomic Force Microscopy," *Journal of Dynamic Systems, Measurement and Control, Transactions of the ASME*, 126(2), pp. 327-335.

**Dadfarnia, M.**, Jalili, N., Liu, Z., and Dawson, D.M., 2004, "An Observer-based Piezoelectric Control of Flexible Cartesian Robot Arms: Theory and Experiment," *Control Engineering Practice*, 12(8), pp. 1041-1053.

Nassirharand, A., Karimi, H., and **Dadfarnia, M.**, 2003, "A New Software Tool for Synthesis of Linear PID Controllers," *Advances in Engineering Software*, 34(9), pp. 551-557.

Jalili, N., Wagner, J., and **Dadfarnia, M.**, 2003, "A Piezoelectric Driven Ratchet Actuator Mechanism with Application to Automotive Engine Valves," *Mechatronics*, 13(8-9), pp. 933-956.

### **Conference Proceedings:**

Sanders, J.W., Jamshidi, N., Jamshidi, N., **Dadfarnia, M.**, Subramanian, S., Stubbins, J., 2021, "Simulation of Intergranular Void Growth Under the Combined Effects of Surface Diffusion, Grain Boundary Diffusion, and Bulk Creep," TMS 2021 150th Annual Meeting & Exhibition Supplemental Proceedings. The Minerals, Metals & Materials Series. Springer, Cham. [https://doi.org/10.1007/978-3-030-65261-6\\_76](https://doi.org/10.1007/978-3-030-65261-6_76), virtual, March 15-18, 2021, pp. 853-863.

Nan, Z., Komoda, R., Yamada, K., Volkert, C. A., Tian, L., Kirchheim, R., Sofronis, P., Hosseinsarani, Z., **Dadfarnia, M.**, Kubota, M., Staykov, A., 2020, "Effect of Ammonia Impurity on Hydrogen Embrittlement of SCM440 Low-Alloy Steel in Hydrogen Gas," *Proceedings of the International Society of Offshore and Polar Engineering Conference*, virtual, October 11-16, 2020, ISOPE-I-20-4120, pp. 3030-3035.

Nagao, A., Wang, S., Nygren, K.E., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2017, "Effect of Hydrogen on Fatigue-Crack Growth of a Ferritic-Pearlitic Low Carbon Steel," *Proceedings of the ASME 2017 Pressure Vessels and Piping Conference*, Waikoloa, Hawaii, July 16-20, 2017, PVP2017-66273.

**Dadfarnia, M.**, Nagao, A., Somerday, B.P., Schembri, P.E., Foulk, J.W., III, Nibur, K. A., Balch, D.K., Ritchie, R.O., and Sofronis, P., 2017, "Modeling Hydrogen-induced Fracture and Crack Propagation in High Strength Steels," *2016 International Hydrogen Conference: Materials Performance in Hydrogen 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. 572-580.

Hosseini, Z.S., **Dadfarnia, M.**, Nibur, K.A., Somerday, B.P., Gangloff, R.P., and Sofronis, P., 2017, "Trapping Against Hydrogen Embrittlement," *2016 International Hydrogen Conference: Materials Performance in Hydrogen*

- 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 Change of Low Carbon and Low-Alloy Steels Caused by Hydrogen-Induced Fatigue-Crack Growth," *2016 International Hydrogen Conference: Materials Performance in Hydrogen 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. 228-234.
- Nygren, K.E., Nagao, A., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2015, "Effect of Hydrogen on Fatigue-Crack Growth Behavior of Types 316L and 304 Austenitic Stainless Steels," *The 169th Iron and Steel Institute of Japan (ISIJ) Meeting*, Tokyo, Japan, March 18-20, 2015, CAMP-ISIJ, Vol. 28, pp. 301.
- Nagao, A., Nygren, K.E., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2015, "Effect of Hydrogen on Tensile and Fatigue-Crack Growth Behaviors of Types 316L and 304 Austenitic Stainless Steels," *Joint HYDROGENIUS and I2CNER International Workshop*, Kyushu, Japan, February 4, 2015, pp. 124-133.
- Sofronis, P., Nagao, A., **Dadfarnia, M.**, Wang, S., Martin, M.L., Somerday, B.P., Ritchie, R.O., and Robertson, I.M., 2014, "Micromechanics of Hydrogen-Induced Fracture: From Experiments and Modelling to Prognosis," *The 4th International Symposium on Steel Science (ISSS 2014)*, Kyoto, Japan, Nov. 3-6, 2014, pp. 43-50.
- Nagao, A., Smith, C.D., Martin, M.L., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2014, "The Role of Plasticity in Hydrogen Embrittlement Fracture of Lath Martensitic Steel," *The 4th International Symposium on Steel Science (ISSS 2014)*, Kyoto, Japan, Nov. 3-6, 2014, pp. 87-90.
- Nagao, A., Smith, C.D., **Dadfarnia, M.**, Sofronis, P., and Robertson, I.M., 2014, "Interpretation of Hydrogen-Induced Fracture Surface Morphologies for Lath Martensitic Steel," *Procedia Materials Science*, 20<sup>th</sup> European Conference on Fracture (ECF20), Trondheim, Norway, June 30-July 4, 2014, Vol. 3, pp. 1700-1705. (DOI: 10.1016/j.mspro.2014.06.274).
- Nagao, A., Eftink, B.P., **Dadfarnia, M.**, Somerday, B.P., and Sofronis, P., 2014, "The Effect of Nano-Sized TiC Precipitates on Hydrogen Embrittlement of Tempered Lath Martensitic Steel," *2012 International Hydrogen Conference: Hydrogen-Materials Interactions*, B. P. Somerday, and P. Sofronis, eds., ASME Press, New York, NY, Proceedings of the 2012 International Hydrogen Conference, Grand Teton National Park, Wyoming, September 9-12, 2012, pp. 127-135.
- Sofronis, P., **Dadfarnia, M.**, Novak, P., Yuan, R., Somerday, B.P., Robertson, I.M., Ritchie, R.O., Kanezaki, T., and Murakami, Y., 2009, "A Combined Applied Mechanics/Materials Science Approach Toward Quantifying the Role of Hydrogen on Material Degradation," *Proceedings of the 12<sup>th</sup> International Conference on Fracture*, Ottawa, Ontario, Canada, July 12-17, 2009.
- Dadfarnia, M.**, Sofronis, P., Somerday, B.P., Robertson, I.M., Liu, J.B., and Johnson, D.D., 2009, "Modeling Issues on Hydrogen-Induced Intergranular Cracking Under Sustained load," *Effect of Hydrogen on Materials*, B.P. Somerday, P. Sofronis, and R. Jones, eds., ASM International, Materials Park, OH, Proceedings of the 2008 International Hydrogen Conference, Grand Teton National Park, Wyoming, September 7-10, 2008, pp. 613-621.
- Dadfarnia, M.**, Sofronis, P., Somerday, B.P., and Robertson, I.M., 2009, "Effect of Remote Hydrogen Boundary Conditions on the Near Crack-Tip Hydrogen Concentration Profiles in a Cracked Pipeline: Fracture Toughness Assessment," *Materials Innovations in an Emerging Hydrogen Economy: Ceramic Transactions, Vol. 202*, G. Wicks and J. Simons, eds., Proceedings of Materials Innovations in an Emerging Hydrogen Economy Conference, Cocoa Beach, Florida, February 24-27, 2008, pp. 187-200.
- Dadfarnia, M.**, Somerday, B.P., Moody, N.R., Sofronis, P., and Robertson, I.M., 2007, "A Combined Materials Science/Applied Mechanics Approach Toward Understanding the Role of Microstructure in Hydrogen Embrittlement of Materials," *Proceedings of the International Hydrogen Energy Development Forum*, Kyushu University, Fukuoka, Japan, February 1-2, 2007, pp. 58-67.
- Dadfarnia, M.**, Sofronis, P., Robertson, I., Somerday, B.P., Muralidharan, G., and Stalheim, D., 2007, "Micromechanics of Hydrogen Transport and Embrittlement in Pipeline Steel," *Proceedings of the Materials Division, the ASME Non-Destructive Evaluation Division and the ASME Pressure Vessels and Piping Division*, Proceedings of the 2006 International Mechanical Engineering Congress and Exposition (IMECE'06), Chicago, Illinois, November 5-10, 2006, pp. 741-750.



**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 6<sup>th</sup> ASME International Pipeline Conference, IPC 2006, Vol. 3A*, Calgary, Alberta, Canada, September 26-29, 2006, pp. 193-199.

**Dadfarnia, M.**, Dawson, D.M., and Jalili, N., 2003, "An Investigation of Damping Mechanisms in Translational Euler-Bernoulli Beams Using a Lyapunov-Based Stability Approach," *Proceedings of the ASME Dynamic Systems and Control Division*, Washington, DC, November 15-21, 2003, pp. 3-11.

Jalili, N., **Dadfarnia, M.**, and Dawson, D.M., 2003, "Distributed-Parameters Base Modeling and Vibration Analysis of Micro-Cantilevers Used in Atomic Force Microscopy," *Proceedings of the ASME Design Engineering Technical Conference, Vol. 5: 19<sup>th</sup> Biennial Conference on Mechanical Vibration and Noise*, Chicago, Illinois, September 2-6, 2003, pp. 1643-1651.

**Dadfarnia, M.**, Jalili, N., Xian, B., and Dawson D.M., 2003, "Lyapunov-based Piezoelectric Control of Flexible Cartesian Robot Manipulators," *Proceedings of the American Control Conference, Vol. 6*, Denver, Colorado, June 4-6, 2003, pp. 5227-5232.

Liu, Z., Jalili, N., **Dadfarnia, M.**, and Dawson, D.M., 2002, "A Reduced-order Observer based Piezoelectric Control of Flexible Cartesian Robot Manipulator," *Proceedings of the ASME Dynamic Systems and Control Division, Vol. 71*, New Orleans, Louisiana, November 17-22, 2002, pp. 395-401.

**Dadfarnia, M.**, Jalili, N., and Esmailzadeh, E., 2002, "On the Selection of Time-Functions in the Galerkin Approximation Used for the Timoshenko Beam Theory," *Proceedings of the 2002 CanCNSM Conference, Vol. II*, Vancouver, British Columbia, Canada, June 19-23, 2002, pp. 559-570.

Jalili, N., Wagner, J., and **Dadfarnia, M.**, 2002, "Design and Development of a Piezoelectric-Based Camless Automotive Engine Valve", *Proceedings of the 8<sup>th</sup> Mechatronics Forum International Conference*, Enschede, Netherlands, June 24-26, 2002, pp. 88-97.

Jalili, N., **Dadfarnia, M.**, Hong, F., and Ge, S.S., 2002, "Adaptive Non Model-Based Piezoelectric Control of Flexible Beams with Translational Base," *Proceedings of the American Control Conference, Vol. 5*, Anchorage, Alaska, May 8-10, 2002, pp. 3802-3807.

Nosier, A. and **Dadfarnia, M.**, 2001, "A Two Dimensional Elasticity Formulation for Laminated Composite Beams," *Proceedings of the 5th International & 9th Annual Mechanical Engineering Conference*, Rasht, Iran, May 27-29, 2001, pp. 53-59.

## **Presentations:**

"Toward Mechanistic Modelling of Hydrogen-Accelerated Fatigue Crack Growth", HYDROGENIUS, I2CNER and HydroMate Joint Research Symposium 2020, Fukuoka, Japan, January 30, 2020.

"A Combined Micromechanics/Materials-Science Approach to Understanding Hydrogen Attack", BP-International Centre for Advanced Materials 2019 (BP-ICAM), Manchester, United Kingdom, October 14-16, 2019.

"Modeling Hydrogen-Induced Fracture of Lath Martensitic Steels", *Materials Science & Technology 2019 Conference & Exhibition (MS&T'19)*, Portland, Oregon, September 29-October 3, 2019.

"Plasticity-Induced Intergranular and "Quasi-Cleavage" Fracture of Lath Martensitic Steels in Hydrogen", *ECF22 22<sup>nd</sup> European Conference on Fracture*, Belgrade, Serbia, August 26-31, 2018.

"Modeling Hydrogen Deformation Interactions and Crack Propagation", *TMS2014 143<sup>rd</sup> Annual Technical Meeting & Exhibition*, San Diego, California, February 16-20, 2014.

"Recent developments on modeling the hydrogen deformation interactions: implications to fracture", *2012 International Hydrogen Conference: Hydrogen-Materials Interactions*, Grand Teton National Park, Wyoming, September 9-12, 2012.

"On Modeling Hydrogen-Induced Intergranular Cracking Under Sustained-Load", *Materials Science & Technology 2011 Conference & Exhibition (MS&T'11)*, Columbus, Ohio, October 16-20, 2011.

"On Modeling Hydrogen-Induced Sustained-Load Intergranular Cracking", *47<sup>th</sup> Annual Technical Meeting, Society of Engineering Science (SES 2010)*, Ames, Iowa, October 4-6, 2010.

“A Methodology for Studying Hydrogen Embrittlement in a Steel Pipeline”, *45<sup>th</sup> 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”, *7<sup>th</sup> 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'06)*, 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'02)*, 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,” Canadian Nuclear Safety Commission Report RSP-0286.

KA Nibur, K. A., Somerday, B. P., San Marchi, C., Foulk III, J. W., Dadfarnia, M., Sofronis, P., and Hayden, G. A. 2010, “Measurement and Interpretation of Threshold Stress Intensity Factors for Steels in High-Pressure Hydrogen Gas,” Sandia National Laboratories Report SAND2010-4633.

Dadfarnia, M., Sofronis, P., Schembri, P. Somerday, B. P., and Balch, D., 2009, “Mechanical and Environmental Transferability for the Application of Single Parameter Fracture Mechanics in Hydrogen Isotope Embrittlement,” Los Alamos National Laboratory Report LA-U R-09-07233.

Sofronis, P., Robertson, I. M., Dadfarnia, M., and Martin, M. L., 2008, “Report on the Susceptibility of the Kinder-Morgan Pipeline to Hydrogen Embrittlement”.