Exponent®
Engineering & Scientific Consulting

Behrouz Haghgouyan, Ph.D.

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Professional Profile

Dr. Haghgouyan specializes in the failure analysis and mechanical behavior of engineering materials, with specific expertise in metallurgy, materials characterization, and deformation mechanisms of metals. He has particular interest in assessing fracture and fatigue behavior of NiTi-based shape memory alloys (SMAs) using novel experimental test methods and computational mechanics.

His expertise includes fracture mechanics-based analyses, materials characterization using a variety of techniques including mechanical testing, metallography, optical and electron microscopy, and finite element modeling.

Prior to joining Exponent, Dr. Haghgouyan was a postdoctoral research associate at Texas A&M University, where he worked on development and characterization of durable and damage tolerant SMAs for use in actuation applications. Specifically, he studied structural and functional fatigue of high-temperature SMAs, such as NiTiHf, and conducted experiments under various thermomechanical loadings for model calibration/validation.

Dr. Haghgouyan completed his Ph.D. in Materials Science and Engineering at Texas A&M University, where he studied deformation and fracture of NiTi-based SMAs. His work focused on developing and modifying experimental test methods to measure mechanical properties, such as fracture toughness and fatigue crack growth rate, in phase transforming materials using Nitinol as the choice material. Additionally, he leveraged computational tools to simulate and predict failure by computing fracture mechanics parameters using commercial finite element software (Abaqus).

Academic Credentials & Professional Honors

M.Eng., Aerospace Engineering, Texas A&M University, 2021

Ph.D., Materials Science and Engineering, Texas A&M University, 2020

Academic Appointments

Postdoctoral Research Associate, Aerospace Engineering, Texas A&M University, 2020-2021

Prior Experience

Postdoctoral Research Associate, Texas A&M University, 2020-2021

Professional Affiliations

The Minerals, Metals & Materials Society (TMS)

American Society of Mechanical Engineers (ASME)

American Institute of Aeronautics and Astronautics (AIAA)

ASM International

Languages

Azerbaijani

Persian

Publications

Haghgouyan, B., Young, B., Picak, S., Baxevanis, T., Karaman, I. and Lagoudas, D.C. A unified description of mechanical and actuation fatigue crack growth in shape memory alloys. Acta Materialia 2021; 217:117155.

Jape, S., Young, B., Haghgouyan, B., Hayrettin, C., Baxevanis, T., Lagoudas, D.C. and Karaman, I. Actuation-Induced stable crack growth in near-equiatomic nickel-titanium shape memory alloys: Experimental and numerical analysis. International Journal of Solids and Structures 2021; 221:165-179.

Abut, B., Haghgouyan, B., Karaman, I. and Lagoudas, D.C. Effect of specimen thickness on the fracture toughness of a NiTi shape memory alloy. Shape Memory and Superelasticity 2021; 7(1):90-100.

Mohajeri, M., Case, R., Haghgouyan, B., Lagoudas, D.C. and Castaneda, H. Loading influence on the corrosion assessment during stress-induced martensite reorientation in nickel-titanium SMA. Smart Materials and Structures 2020; 29(3):035013.

Young, B., Haghgouyan, B., Lagoudas, D.C. and Karaman, I. Effect of temperature on the fracture toughness of a NiTiHf high temperature shape memory alloy. Shape Memory and Superelasticity 2019; 5(4):362-373.

Haghgouyan, B., Jape, S., Baxevanis, T., Karaman, I. and Lagoudas, D.C. Stable crack growth in NiTi shape memory alloys: 3D finite element modeling and experimental validation. Smart Materials and Structures 2019; 28(6):064001.

Haghgouyan, B., Hayrettin, C., Baxevanis, T., Karaman, I. and Lagoudas, D.C. Fracture toughness of NiTi–towards establishing standard test methods for phase transforming materials. Acta Materialia 2019; 162:226-238.

Haghgouyan, B., Shafaghi, N., Aydıner, C.C. and Anlas, G. Experimental and computational investigation of the effect of phase transformation on fracture parameters of an SMA. Smart Materials and Structures 2016; 25(7):075010.

Presentations

Mechanical and Actuation Fatigue in Ni-Rich NiTiHf High Temperature Shape Memory Alloys, TMS Annual Meeting & Exhibition, San Diego, CA, 2020.

Fracture Toughness and Crack Growth Behavior in NiTi and NiTiHf Shape Memory Alloys, IUTAM Symposium on Phase Transformations in Shape Memory Materials: Modeling and Applications, Austin,

TX, 2019.

Crack Growth in Shape Memory Alloys under Thermomechanical Loading, SPIE Smart Structures + Nondestructive Evaluation, Denver, CO, 2019.

Crack Growth Behavior in NiTi Shape Memory Alloys under Mode-I Isothermal Loading, ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems, San Antonio, TX, 2018.

On the Experimental Evaluation of the Fracture Toughness of Shape Memory Alloys, TMS Annual Meeting & Exhibition, Phoenix, AZ, 2018.

Evaluation of Displacement Field and Transformation Zone at Crack Tip of NiTi, International Conference on Martensitic Transformations, Bilbao, Spain, 2014.

Peer Reviews

Smart Materials and Structures

Journal of Intelligent Materials Systems and Structures

Shape Memory and Superelasticity