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Research Interests

Nonlinear continuum mechanics, Modeling of multi-field interactions with matter in continuum scale, Active materials and smart structures, Phase transformation (Magnetic Shape Memory Alloys), Soft material (Magneto Active Polymers), Computational mechanics, Liquid crystals, Biomechanics.

Education

Ph.D. Aerospace Engineering, Texas A&M University, College Station, Texas USA (December 2012), GPA: 3.925/4.

Dissertation: “Magneto-thermo-mechanical coupling, stability analysis and phenomenological constitutive modeling of magnetic shape memory alloys (MSMAs)”, Advisor: Dr. Dimitris C. Lagoudas.

M.S. Aerospace Engineering, Indian Institute of Technology, Kanpur, India (2005), CPI(Cumulative Performance Index): 8.25/10.

Thesis: “A finite elasticity formulation based framework for analysis of cable and membranes”, Advisor: Dr. C. S. Upadhyay.

B.E. Mechanical Engineering, Jadavpur University, Kolkata, India (2002). Percentage: 71/100.

Research Experience

2017–now Department of Aerospace Engineering, IIT Bombay, India –Assistant Professor.

2016–2017 Laboratoire de Mécanique des Solides (LMS), Ecole Polytechnique, France –Postdoctoral Research Fellow.

Theoretical and numerical study of instabilities in magnetorheological elastomers and liquid crystals.

2013–2016 Institute of Mechanics, TU Dortmund, Germany –Postdoctoral Research Fellow.

Material modeling and computational finite deformation magnetomechanics for magnetoactive polymers.

2006–2012 Texas A&M University, College Station, Texas USA – Graduate Research Assistant.
Ph.D. level coursework and research.

2005–2006 Indian Institute of Technology, Kanpur, India –Research Assistant.

Consulting project: Development of FEA code for fluid structure interaction problem of parachute system.

2003–2005 Indian Institute of Technology, Kanpur, India–Graduate student.
MS research and coursework.

Teaching Experience

- 2020 (Fall) Indian Institute of Technology Bombay, Mumbai, India
AE 227: Solid Mechanics [UG Core]
- 2020 (Win) Indian Institute of Technology Bombay, Mumbai, India
AE 738: Tensors for Engineers [PG Elective]
- 2019 (Fall) Indian Institute of Technology Bombay, Mumbai, India
AE 227: Solid Mechanics [UG Core]
- 2019 (Win) Indian Institute of Technology Bombay, Mumbai, India
AE 738: Tensors for Engineers [PG Elective] (Introduced this course)
- 2018 (Fall) Indian Institute of Technology Bombay, Mumbai, India
AE 227: Solid Mechanics [UG Core]

Postdocs

1. Palas Mandal [2021–]: Modeling and Simulations of Biological Growth

Ph.D students

1. Avinash Kumar [2018–]: Modeling and Simulations of Magnetic Shape Memory Alloys
2. Rahul Jangid [2019–]: Modeling and Simulations of Traumatic Brain Injury
3. Arijit Garai [2019–]: Experiments and modeling of soft Magnetic Polymers
4. Swapna Gane (External, Mercedes-Benz) [2019–]: Modeling and Simulations of Stretchable OLED
5. Vivek Kumar Singh [2021–]: Modeling and Simulations of Magnetic Gels

Masters students

1. Kumaran S [2019–2020]: Hyperelastic Material Modeling of Blast Induced Traumatic Brain Injury
2. Shivam Kannoujia [2019–2020]: Chemo-Mechanics of Growth and Some Related Solutions

Journal Publications

11. K. Halder. *Constitutive modeling of magneto-viscoelastic polymers, demagnetization correction, and field-induced Poynting effect*, International Journal of Engineering Science, Vol. 165, 2021, pp.103488.

10. K. Haldar, D.C Lagoudas. *Lie symmetry and conservation laws for magneto-static magnetic shape memory alloys system*, Proceedings of the Royal Society A, Vol. 476, 2020, pp.20200168.
9. K. Danas, D. Mukherjee, K. Haldar, N.Triantafyllidis. *Bifurcation analysis of twisted liquid crystal bilayers*, Journal of the Mechanics and Physics of Solids, Vol. 123, 2018, pp.61-79.
8. K. Haldar, D.C Lagoudas. *Dynamic Magnetic Shape Memory Alloys Responses: Eddy Current Effect and Joule Heating*, Journal of Magnetism and Magnetic Materials, Vol. 465, 2018, pp.278-289.
7. K. Haldar, C .Pal. *Rate Dependent Anisotropic Constitutive Modeling of Brain Tissue Undergoing Large Deformation*, Journal of the Mechanical Behavior of Biomedical Materials, Vol. 81, 2018, pp.178-194.
6. K. Haldar, B. Kiefer, A. Menzel. *Finite Element Simulation of Rate-Dependent Magneto-Active Polymer Response*, Smart Materials and Structures, Vol. 25, 2016, pp.104003.
5. K. Haldar, G. Chatzigeorgiou, D.C Lagoudas. *Single Crystal Anisotropy and Coupled Stability Analysis for Variant Reorientation in Magnetic Shape Memory Alloys*, European Journal of Mechanics - A/Solids, Vol. 54, 2015, pp.53-73.
4. K. Haldar, D. C. Lagoudas. *Constitutive Modeling of Magnetic Shape Memory Alloys with Discrete and Continuous Symmetries*, Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences, Vol. 470, 2014, pp.20140216.
3. K. Haldar, D. C. Lagoudas, I. Karaman. *Magnetic Field-Induced Martensitic Phase Transformation in Magnetic Shape Memory Alloys: Modeling and Experiments*, Journal of the Mechanics and Physics of Solids, Vol. 69, 2014, pp.33-66.
2. K. Haldar, B. Kiefer, D.C Lagoudas. *FE-Analysis of the Demagnetization Effect and Stress Inhomogeneities in MSMA Samples*, Philosophical Magazine, DOI: 10.1080/14786435.2011.602031, 2011.
1. K. Haldar, G. Chatzigeorgiou, D.C Lagoudas. *Stability Analysis of Magnetostatic Boundary Value Problems for Magnetic SMAs*, Journal of Intelligent Material Systems and Structures, Vol. 21, 2010, pp.1103-1116.

Conference and Proceeding Presentations

22. A. Kumar, K. Haldar, *Magnetic Shape Memory Alloys: Phenomenological Constitutive Modeling and Analysis*, 3rd International Conference on Structural Integrity and Exhibition (SICE 2020 e-conference), IIT Bombay, India, 11-13 and 18-20 December 2020
21. R. Jangid, K. Haldar, *Coupling of Mechanical Deformation and Electrophysiology of Brain Neuron Cell*, 3rd International Conference on Structural Integrity and Exhibition (SICE 2020 e-conference), IIT Bombay, India, 11-13 and 18-20 December 2020
20. K. Haldar, *Field-Induced Poynting Effect in Magneto-Active Polymers in Simple Shear*, 3rd International Conference on Structural Integrity and Exhibition (SICE 2020 e-conference), IIT Bombay, India, 11-13 and 18-20 December 2020
19. K. Haldar, *Finite Element Analysis for Large Deformation Viscoelasticity*, 5th National Finite Element developers's/User's meet (VSSC/ISRO), Kerala (Digital Platform), India, December 11-12, 2020

18. K. Haldar, *Large Deformation Based Material Modeling and FE Implementations*, 3rd National Finite Element developers's/User's meet (VSSC/ISRO), Chennai, India, December 14, 2018
17. K. Haldar, *Anisotropic Effect of Nerve Axons on Brain Tissue Deformation and Rotational Induced 2D Shear Deformation*, 7th International Symposium on Human Modeling and Simulation in Automotive Engineering, Berlin, Germany, October 18-19, 2018
16. K. Haldar, *High Frequency Dynamic Magnetic Shape Memory Alloy Responses*, 2nd International Conference on Structural Integrity and Exhibition (SICE 2020), Hyderabad, India, July 25-27, 2018
15. K. Haldar, K. Danas, and N. Triantafyllidis *Bilayer Liquid Crystal and Freedericksz Instability*, Proceedings of the 7th GACM Colloquium on Computational Mechanics, Stuttgart, Germany, October 11-13, 2017
14. A. Menzel, K. Haldar, and B. Kiefer *Finite element simulation of rate-dependent magneto-active polymer response*, EMMC15 - European Mechanics of Materials Conference 2016, Brussels, Belgium, September 7-9, 2016
13. A. Menzel, K. Haldar, B. Kiefer, F. J. Hiptmair, and Z. Major. *Phenomenological Modeling and Simulations of Magneto-Viscous Polymers*, ESMC15 - 9th European Solid Mechanics Conference 2015, Madrid, Spain, July 6-10, 2015
12. B. Kiefer, K. Haldar, A. Menzel. *Modeling, Simulation and Parameter Identification for Rate-Dependent Magnetoactive Polymer Response*, Proceedings in Applied Mathematics and Mechanics, Lecce, Italy, March 23-27, 2015
11. A. Menzel, K. Haldar, B. Kiefer, F. J. Hiptmair, and Z. Major. *Constitutive modelling of magneto-active viscous polymers*, EMMC14 - European Mechanics of Materials Conference 2014, Gothenburg, Germany, August 27-29, 2014
10. K. Haldar, B. Kiefer, and A. Menzel. *Constitutive Modeling of Magneto-Viscous Polymers*, 14th Pan-American Congress of Applied Mechanics, Santiago, Chile, March 24-28, 2014
9. K. Haldar, B. Kiefer, A. Menzel, F. J. Hiptmair, and Z. Major. *Modeling and Simulation of Rate-Dependent Magneto-Active Polymers*, Proceedings in Applied Mathematics and Mechanics, Erlangen, Germany, March 10-14, 2014
8. K. Haldar, B. Kiefer, and D.C. Lagoudas. *Finite Element Analysis of Stress Inhomogeneities in MSMA Samples Caused by Magnetic Body Forces and Couples*, 3rd International Conference on Ferromagnetic Shape Memory Alloys, Dresden, Germany, July 18-22, 2011
7. K. Haldar, D.C. Lagoudas. *Model Predictions of Strain and Magnetization under Magneto-Thermo-Mechanical Loading Paths in MSMAs*, SPIE Smart Structures/Nondestructive Evaluation Conference, San Diego, CA, USA, March 9, 2011.
6. K. Haldar, D.C. Lagoudas, B. Basaran, I. Karaman. *Constitutive Modeling of Magneto-thermo-Mechanical Response of Field-Induced Phase Transformations in NiMnCoIn Magnetic Shape Memory Alloys*, Proceedings of ASME 2010 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SMASIS 2010, September 28 - October 1, 2010, Philadelphia, PA, USA.
5. D.C. Lagoudas, K. Haldar, B. Basaran, I. Karaman. *Constitutive Modeling of Magneto-Mechanical Coupling Response of Magnetic Field-Induced Phase Transformations in NiMnCoIn Magnetic Shape Memory Alloys*, SPIE Smart Structures and Materials/NDE Conference, San Diego, USA, March 7-11, 2010.

4. G. Chatzigeorgiou, K. Haldar, D.C. Lagoudas. *Stability of the Magnetomechanical Problem in Magnetic Shape Memory Alloys*, SPIE Smart Structures and Materials/NDE Conference, San Diego, USA, March 7-11, 2010. Vol. 7644, 76440Y.
3. K. Haldar, D.C. Lagoudas, B. Basaran, I. Karaman. *Modeling of Magnetic Field-Induced Phase Transformations in NiMnCoIn Magnetic Shape Memory Alloys*, The 2009 Joint ASCE/ASME/SES Conference on Mechanics and Materials, Blacksburg, VA, USA, June 24-27, 2009.
2. D.C. Lagoudas, B. Kiefer, and K. Haldar. *Magnetic field-induced reversible phase transformation in magnetic shape memory alloys*, Vol. 7289, 72891O, 2009 SPIE San Diego, CA, USA, March 8-12, 2009.
1. D.C. Lagoudas, B. Kiefer, and K. Haldar. *Magneto-Mechanical Finite Element Analysis of Magnetic Shape Memory Alloys with body Force and Body Couple*, ASME Smart Materials, Adaptive Structures and Intelligent Symposium, SMASIS08-533, Elliott City, MD, USA, October 28-30, 2008.

Invited talk

5. *Magnetomechanics Modeling of Magneto-Active Polymers*, Mechanical Engineering Research Seminar, South Dakota Mines Mechanical Engineering, USA, November 5th, 2020.
4. *Modeling of Magnetic Shape Memory Alloys and Symmetry*, Swansea University, UK, May 13th, 2019.
3. *Modeling and Finite Element Simulation of Rate-Dependent Magneto-Active Polymer Response*, RFM les 13 et 14 juin 2016 sur le thème “Couplages multiphysiques”, France, June 13-14, 2016.
2. *Magnetic Shape Memory Alloys (MSMAs) and its Applications*, Workshop on the physics and mechanics of active solids, Paris, France, April, 2016.
1. *Discrete Symmetry and Modeling of Magnetic Shape Memory Alloys*, Lehrstuhl für Technische Mechanik, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany, November, 2015.

Journal reviewer

Smart Material and Structures, Journal of Intelligent Material Systems and Structures, International Journal of Plasticity.