

In-Person Departmental Colloquium

Department of Materials Science
and Chemical Engineering



Wednesday
November 9, 2022
1:00 – 2:00 p.m.

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Atlanta, Georgia

Processing Design in Multiphase Structures - Additive Manufacturing and Machining

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Abstract

A design framework is developed with direct linkages between Process Path parameters and the final microstructures without resorting to experimentation or FEM. State of the art microstructural design and fabrication methodology is complemented with a multi-scale computational scheme to optimize structure-property relationship. The design framework is based on a digital representation of the microstructure using n-point statistical correlation functions and benefits from machine learning methodologies. The framework provides a direct link between the resulting part's microstructure, mechanical properties, residual stresses, porosity, and distortions. By virtue of the availability of direct mathematical and analytical solutions, the relationships between process parameters and resulting part microstructure and properties will be analytically reversed to yield a non-iterative methodology for machining and additive manufacturing in Al7475 and Ti64 materials.

Biosketch

Dr. Hamid Garmestani is a Professor of Materials Science and Engineering at the Georgia Institute of Technology. He has developed methodologies in Microstructure Sensitive Design (MSD) framework that addresses an inverse methodology and innovations in various aspects of processing, structure-property relationships, simulation-based design of materials, and statistical continuum mechanics for homogenization in composites and polycrystalline materials. He has applied these methodologies to structural alloys (Al, Ti and Steel) and more recently in Microstructure design of additive manufacturing and machined surfaces. He has more than 400 publications with 8525 citations and an H-index of 49 and 4 books. He has organized more than 30 workshops and symposia in the emerging subject of materials design. He was awarded "Superstar in Research" by FSU-CRC in year 2000. He was the recipient of the 2000 Engineering Research Award of the FAMU-FSU College of Engineering and of the Faculty Award for Research from NASA. He is Associate Editor of the Journal of Mechanics of Materials, Computers, Materials and Continua and Theoretical and Applied Multi-scale Modeling of Materials and was in the editorial board of several other journals such as Engineering Materials and Technology and International Journal of Plasticity.