

FEB 02, 2017

# Carbon Nanotube Forests and Yarns: Mechanical Behavior and Engineering Applications

## ABSTRACT:

Carbon nanotube (CNT) forests possess unique properties (e.g., high thermal and electrical conductivity, optical absorption, and mechanical compliance), which have rendered them as excellent candidates for applications such as thermal and electrical interfaces, super dark absorbers, and tissue engineering. Coated CNTs are also attractive because of their potential applications as optical, electronic, catalytic, sensing, and magnetic materials or as reinforcement in composite materials. In this presentation, the relation between morphological differences between CNT forests and their mechanical behavior will be demonstrated. The micro-compression response of the CNT forests will be presented for the case of different growth induced morphological gradients along the height of the CNT forests and for the case of tailored mechanical constraints using coating and wetting of the CNTs. CNT aerial density and tortuosity are introduced as two key factors governing the overall mechanical response of the uncoated CNT forests to local compressive loading. Furthermore, superior performance of these materials in biomedical applications such as cardiac tissue engineering and nano-bioactuators will be demonstrated. This study elucidates the deformation and failure modes in CNT forests, which govern their performance in many applications including biomedicine.



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## BIOGRAPHY:

Parisa Abadi is an NIH Postdoctoral Research Fellow in the Center for Nanomedicine at Harvard Medical School and Brigham and Women's Hospital. Prior to starting her postdoc, she was a Visiting Assistant Professor in the Mechanical Engineering Department at the Stevens Institute of Technology. Dr. Abadi received her Ph.D. in Mechanical Engineering from Georgia Institute of Technology, M.S. degree in Mechanical Engineering from University at Buffalo, the State University of New York, and B.S. degree in Aerospace Engineering from Sharif University of Technology. She is the recipient of several awards and honors including 2016 postdoctoral fellowship in the NIH T32 program at Harvard Medical School entitled "Organ Design and Engineering Postdoctoral Training", 2016 microgrant from the Brigham Research Institute and Center for Faculty Development and Diversity's Office for Research Careers, 2015 AAUW Postdoctoral Research Fellowship, outstanding poster award at the 2011 and 2012 Georgia Tech Research and Innovation Conference, and the best student paper award at the 2009 IMAPS Advanced Technology Workshop on Thermal Management. Dr. Abadi's research is at the intersection of mechanics, materials, and biomedicine. She explores the mechanical behavior and biomedical applications of hierarchical materials such as conductive nanostructured materials and polymeric microengineered biomaterials.