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Multifunctional Structures Enabled through Piezoelectric Nanowire Arrays



Henry Sodano

Professor, Department of Aerospace Engineering, University of Michigan, Ann Arbor, MI

ABSTRACT:

Nano electromechanical systems (NEMS) developed using piezoelectric nanowires (NWs) have gained an immense interest in energy harvesting applications as they are able to convert different forms of mechanical energy sources into electric power and thereby function as reliable power sources for ultra-low power wireless electronics. While progress has been rapid, most technologies have focused on intrinsic piezoelectric materials, whereas ferroelectric materials offer higher electromechanical coupling. In this presentation, new techniques for the synthesis of ferroelectric nanowires and their application to energy harvesting devices will be discussed. In addition to NEMS devices the development of multifunctional materials, which seek to combine multiple material behaviors or properties into a single component will be presented with focus on the development of materials with embedded energy harvesting. The ultimate goal for multifunctional materials is to not only consolidate systems, but also simultaneously improve the behavior in each use. The creation of such a material would yield a paradigm shift and open clear pathways to the acceptance of this new class of materials. This talk will discuss a methodology utilizing functional nanowires to yield new materials with the potential to achieve this goal.

BIOGRAPHY:

Dr. Sodano is a Professor in the Aerospace Engineering Department at the University of Michigan with appointments in the Materials Science and Engineering and Macromolecular Science and Engineering Departments. His research lies in advanced materials with focus on composite materials, multifunctional materials, additive manufacturing, ceramics and nanotechnology. He received his Ph.D. in Mechanical Engineering from Virginia Tech in 2005, his M.S. in 2003 and his B.S. in 2002 also from Virginia Tech. He has published 269 technical articles (6 book chapters, 133 refereed journals published or submitted and 125 proceedings) and made over 100 international presentations including his selection for a presentation at the National Academy's 2008 German-American Frontiers of Engineering Symposium. He currently serves as an associate editor of four journals and was awarded the NSF CAREER award in 2009, the American Society of Composites Young Researcher Award in 2012, the ASME Gary Anderson Award for Early Career Achievement in 2009, Virginia Tech's 2010 Outstanding Recent Alumni Award, Arizona State University's 2009 Faculty Achievement Award in Research Excellence, NASA Tech Brief Awards in 2010 and 2014, and was inducted into Virginia Tech's Academy of Engineering Excellence in 2010. He is a Fellow of ASME and an Associate Fellow of AIAA.