Title:

Nanocomposites and Nanostructured Materials for Photonic, Magnetic, and Electronic Devices

Abstract:

Intermixing of two or more distinct phases at nanometer length scales can result in unique photonic, magnetic, and electronic properties that are not otherwise attainable. Because such properties are highly sensitive to the detailed microstructural and chemical features at these length scales, nanostructured and nanocomposite based functional materials can be carefully engineered for optimal integration with a range of emerging device platforms. This presentation will discuss inter-relationships between structure and properties in a number of archetype nanocomposite materials with a particular emphasis on systems currently of interest for (1) harsh environment sensing platform technologies, (2) thermal energy harvesting and conversion devices, and (3) high frequency magnetic components for emerging power electronics and power conversion applications. The fundamental interplay between the characteristic length scales and interconnectivity of both chemical and structural features of nanostructured and nanocomposite based material systems will be reviewed in the context of their impacts on functional properties. The potential for tuning properties to produce optimal performance or even new functionality at the device and/or system level will also be demonstrated for a number of specific materials and devices that have been recently developed.

Biography:

Dr. Paul R. Ohodnicki, Jr. is a Materials Scientist in the Materials Engineering & Manufacturing Directorate of the National Energy Technology Laboratory. He earned undergraduate degrees in Engineering Physics and Economics from the University of Pittsburgh in 2005, and he earned masters and doctoral degrees in Materials Science and Engineering from Carnegie Mellon University in 2006 and 2008, respectively. Upon graduation, he joined PPG Industries as a Research Engineer and a Visiting Scholar where he worked on designing and scaling up large-area glass coatings for energy efficient architectural windows and concentrating solar power applications. In 2010, Paul joined the National Energy Technology Laboratory where he is currently a senior staff scientist overseeing a number of major programs focused on research and development of advanced functional materials and devices for sensors, power electronics, and energy conversion applications. He has co-authored approximately 100 publications and is a co-inventor on more than 25 patent applications with 9 awarded to date. He is currently serving as

vice-Chair for the Functional Materials Division of TMS and has earned a number of prestigious recognitions throughout his career, with the most recent honors including the Presidential Early Career Award in Science and Engineering (2016), the Advanced Manufacturing and Materials Innovation Award from the Carnegie Science Center (2017), and a nomination for the Samuel J. Heyman Service to America Promising Innovations Medal (2017).