

## An Electroplating-Based Approach to Volumetric Nanomanufacturing And Its Application to Energy Conversion and Storage

By Prof. Mark G. Allen

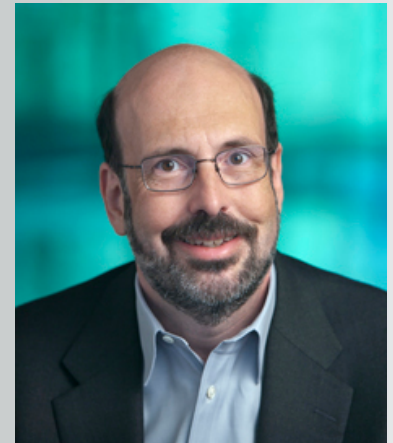
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### ABSTRACT

The manufacture of materials with bulk volumes and precisely controlled nanostructure has led to the creation of materials with surprising and useful mechanical and electrical properties. Recently we have developed a 'top-down' technique based on sequential electroplating that allows the creation of highly-structured multilayer metallic materials, with precisely designed characteristic lengths in the hundreds of nanometers but volumes of manufactured material in the macro range. This electroplating-based approach also enables batch fabrication of nanostructures. The fabrication relies on automated and repeated multilayer electrodeposition of multiple metallic materials, followed by sacrificial etching of one metal. The remaining structure consists of individualized high-lateral-aspect-ratio sub-micron metallic films. Example applications of the use of these nanostructured materials in energy storage and conversion applications, including batteries and magnetic-material-based ultracompact DC/DC power converters, will be discussed.

### BIOGRAPHY

Mark G. Allen received the B.A. degree in chemistry, the B.S.E. degree in chemical engineering, and the B.S.E. degree in electrical engineering from the University of Pennsylvania, Philadelphia, and the S.M. and Ph.D. (1989) degrees from MIT. In 1989 he joined the faculty of the School of Electrical and Computer Engineering, Georgia Institute of Technology, ultimately holding the rank of Regents' Professor and the J.M. Pettit Professorship in Microelectronics, as well as a joint appointment in the School of Chemical and Biomolecular Engineering. In 2013 he left Georgia Tech to become the Alfred Fitler Moore Professor of Electrical and Systems Engineering and Scientific Director of the Singh Nanotechnology Center at the University of Pennsylvania. His research interests are in the development and the application of new micro- and nanofabrication technologies, as well as MEMS. He is a previous Editor-in-Chief of the Journal of Micromechanics and Microengineering, previous co-chair of the IEEE Microelectromechanical Systems Conference and of the Power MEMS conference, and will co-chair the 2016 Solid State Sensor, Actuator, and Microsystems Conference in Hilton Head, SC. He is a Fellow of the IEEE.



### EVENT DETAILS

**DATE:**

Wednesday,  
April 2, 2014

**TIME:**

11:00 AM

**LOCATION:**

Babbio 122  
Stevens Institute of Technology

**ATTENDANCE:**

Public

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Department**