NanOhmics

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TO: Dr. Powell Clois, Karla Pizana

FROM: Mike Mayo

SUBJECT: MSEC Seminar Title, Abstract and Bios

Per your request, Nanohmics is submitting titles, abstracts and brief biographical sketch for two seminar topics. The first topic will consist of a 30-45 discussion on aspects of a scientific career within industry. The second is a technical seminar. Let me know if you have any questions or require any additional information.

Working as a Scientist in a Small High Technology Company

This talk will provide an overview of the multi-disciplinary approach taken by Nanohmics Inc. (Austin, TX) to conduct research and provide novel solutions to challenging problems. A discussion of the skills required by scientists working in this environment will be discussed along with an overview of selected projects the point out the role required by various team members.

Michael W. Mayo, M.S.E.E., Founder, President and VP of Engineering, Nanohmics, Inc.

M.S.E.E., Electro-Optics, Air Force Institute of Technology; B.S.E., Electrical Engineering, University of Central Florida

Michael Mayo's expertise is in optical system design, optical interferometry and phase imaging, fluorescence spectroscopy, analog electronics design, radio-frequency (RF) electronics design and interface, and RF phase-sensitive detection.

At Nanohmics, Mayo oversees the design and construction of prototype deliverables for industrial and government contracts and is Principal Investigator (PI) for numerous electro-optics development programs. He serves as the lead engineer for bioinstrumentation programs which have included instrumentation for automated immunohistochemical and FISH for microtissue cancer diagnostics, fluorescence and FRET-based handheld reader systems, and a water toxicity detetion device that operates based electrochemical impedance changes from biological toxins. The ECIS program has resulted in follow-on contracts that include a multi-unit instrument build for the Army along with full microfluidic cartridge development with embedded electrodes.

Mayo prior experiences have included electro-optical engineering on a deep-UV imaging holographic microscope system, innovative optical sensors for fluorescence lifetime instrumentation, optical instruments for hazardous bacteria identification, ultra-short laser pulse interactions with biological media, and radiometric systems that characterized experimental lasers, sensors, and optical filters.
Mayo has authored more than 20 journal articles and technical reports.

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Tailoring nanoscale and bulk properties of high-performance thermoelectric materials for scalable manufacturing

Thermoelectrics provide a solid-state option for refrigeration and generating electricity from heat. Efforts to convert waste heat into useful electricity typically focus on thermoelectrics with a high figure-of-merit, ZT. However, while these materials have proven performance in high-performance, high-cost systems like the Voyager and Cassini space probes, they are too expensive to employ in most consumer applications. Efforts to provide solid-state refrigeration, such as seat coolers in cars, have also focused on thermoelectrics, but they, too, have had a slow entry into mainstream markets, again due to cost-to-efficiency considerations.

Recently, advances in improving the thermoelectric figure of merit, ZT, have focused on nanostructured devices. At the nanoscale, the electrical behavior becomes dominated by surface interactions, rather than bulk behavior, requiring investigation of the surface states which can be drastically different from bulk states. However, despite the advances made in the nanostructuring of these materials, there are still manufacturing issues that prevent scalability: preparation of nanoscale powders is relatively straightforward, but consolidating that powder into a useful device is typically time consuming and inefficient.

The presentation will discuss recent investigations in the surface state of Bi2Se3, including the impact of single-atom defects and band bending. Additionally, the presentation will discuss recent patented work by Nanohmics, Inc. that seeks to take advantage of these surface states and provide a commercially-scalable nanoscale powder consolidation process.

Presenter: Dr. Chris Mann

Chris Mann, Ph.D., Senior Materials Scientist, Nanohmics, Inc.
Ph.D., Materials Science & Engineering, University of Texas at Austin

Dr. Chris Mann is a Sr. Materials Scientist at Nanohmics, Inc. He received his PhD from the University of Texas in 2013 in Materials Science and Engineering. He received his BS from the University of Oregon in 2008 in Math, Physics, and Chemistry.

Mann has more than 12 years of industry and academic materials research experience. At Nanohmics, Mann develops new product concepts, designs experiments, develops prototypes, and performs simulations and data analysis. Previously, he worked as a materials and nanodevices consultant at Xidex Corp., where he prepared thin films with different deposition and lithographic techniques. Mann characterized the films using several techniques, including atomic force microscopy and electron microscopy. Among his projects, Mann developed lower-cost nano-indentation instrumentation for materials hardness characterization.