INTEGRATED NANOSYSTEMS FOR ENERGY, BIOMEDICAL, AND OTHER APPLICATIONS

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Industry Sector(s): Nanotechnology, Micro/nano Fabrication, Wireless Sensors
Product Category: Energy, Biomedical, and Other

Opportunity Overview

Nanosystems harness the new functionalities and properties of materials and devices at dimensions in the nanometer scale length (1-100 nm). The poster titled "Integrated Nanosystems for Energy, Biomedical, and Other Applications" will present exciting research results and potential commercial applications of nanotechnology-based solar cells, paper and carbon nanotube-based battery, and wireless sensors. Flexible and cost-effective solar cells are fabricated through layer-by-layer self-assembly of copper indium gallium di-selenide nanoparticles and polymers. Paper based lithium ion battery utilizes conductive papers as current collectors. These conductive papers are fabricated from wood micro-fibers coated with carbon nanotube coated through layer-by-layer nano-assembly process. Wireless sensor devices integrate multiple sensors on a single micro-chip and communicate the information wirelessly for continuous and effective monitoring of the stimulants. These integrated nanosystems have good potentials for making commercially competitive products for renewable energy, healthcare, and other applications.

Markets & Applications

Biomedical, Defense, and Consumer Products—Sensors integrated with wireless chips

Competitive Advantage/Value Propositions

Extensive experience and research on integrated nanosystems for energy, biomedical and other applications, micro/nanoelectronics, micro/nano manufacturing, nanoscale-based devices and systems, layer-by-layer assembly for different applications, emerging nanofabrication processes, carbon nanotubes and applications, solar cells, batteries, and wireless sensing systems.

Pending patent applications for multiple applications in energy and medical devices.


Researcher Biographies

Kody Varahramyan, Ph.D.,
Dr. Varahramyan received his Ph.D. in Electrical Engineering from Rensselaer Polytechnic Institute in 1983. From 1982 to 1992 he was with IBM Microelectronics, conducting research and development in the realization of advanced semiconductor technologies. From 1992 to 2008 he was with Louisiana Tech University, where he was the Entergy/LP&L/NOPSI Professor of Electrical Engineering, in recognition of his teaching and research contributions in the microsystems and nanotechnology areas. From September 2000 to June 2008 he was the Director of the Institute for Micromanufacturing, where, from 1992, he had contributed to the growth and development of the Institute, including through planning and setting up of laboratory resources and facilities, development and implementation of major sponsored research efforts, and realization of academic courses and curricula, on the science and engineering of materials, processes, and devices for the realization of micro/nanoscale systems. Since July of 2008, he has been the Vice Chancellor for Research at Indiana University – Purdue University Indianapolis, where he has been responsible for the advancement of research and scholarly activities, including interdisciplinary research programs that address important national and global needs.

Mangilal Agarwal, Ph.D.
Dr. Agarwal received his B.E. degree in Electronics and Communication Engineering from Osmania University, Hyderabad, India, in 1998, and the M.S. and Ph.D. in Engineering from Louisiana Tech University, Ruston, LA, in 2002 and 2004, respectively. Upon receiving his Ph.D. degree, he was employed by Louisiana Tech University, as a Post Doctoral Research Associate, followed by appointments as Research Staff and Research Assistant Professor at the Institute for Micromanufacturing, the largest campus-wide interdisciplinary research institute. He is currently an Associate Director for Research Development at IUPUI, Interim Director of the Integrated Nanosystems Development Institute, and Associate Research Professor in the Electrical and Computer Engineering Department. His main responsibility is to assist with the development of major interdisciplinary research initiatives.

Sudhir Shrestha, Ph. D.
Dr. Shrestha received his B.E. in Electrical and Electronics Engineering from Kathmandu University, Nepal, in 2003 and his Ph.D. in Engineering with Nanotechnology and RF/Wireless emphasis from Louisiana Tech University, LA, in 2009. From 2009 to 2011, he was a Postdoctoral Research Associate at the Integrated Nanosystems Development Institute (INDI) at Indiana University – Purdue University Indianapolis (IUPUI), Indianapolis, IN. Since 2011, he is an Assistant Research Professor in the Department Electrical and Computer Engineering at IUPUI.

Development Plans/Needs

1. The devices are in research and development stage. The development plan includes realization of marketable prototypes of flexible and cost effective photovoltaic cells, flexible and light weight batteries, and wireless chips that integrate multiple sensors and operate with high energy efficiency.

2. Identifying potential partners for commercial development.