Vanderbilt Engineering to lead new defense nanotechnology program

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Nashville, Tenn. - The Vanderbilt School of Engineering will lead a new $2.4 million multi-institutional nanotechnology program funded by the U.S. Army Research Laboratory to develop radically improved electronics, sensors, energy-conversion devices and other critical defense systems.

The Advanced Carbon Nanotechnology Research Program will explore various nanostructures of carbon, including diamond, at the molecular level to develop next-generation materials that can be used in a wide range of defense devices and systems. The Army Research Laboratory funds will support the program’s first year of operation.

"Nanoscale" describes objects that measure approximately a millionth of a millimeter, or roughly 1/100,000th the diameter of a human hair.

“The goal of this cutting-edge research is to gain control of structures and devices at atomic and molecular levels and to learn to efficiently manufacture and use these devices,” said Jimmy L. Davidson, principal investigator of the new program.

Davidson, professor of electrical engineering and professor of materials science and engineering, will coordinate the research efforts. In addition to Vanderbilt, the University of Kentucky, North Carolina State University, the University of Florida and the International Technology Center will participate in the program.

Davidson pointed out that although carbon is the most versatile of elements and is the foundation of most fuels, synthetic materials and biological systems, little is known about its behavior at the nanoscale level.

“Using carbon as a building block in this promising new area of science is a potentially boundless resource not sufficiently explored in today’s research endeavors,” Davidson said.

In addition to conducting research into carbon-based nanotechnology, the new program will train graduate students to work in the emerging field and will establish close interactions among U.S. industry and government laboratories.

Initial goals include developing diamond/carbon nanostructures for biological and chemical sensors, developing a new energy-conversion device, and developing electron emission devices for advanced electronics.

Biological and chemical sensors: Carbon-derived nanotubes, electrodes and microtips could detect toxic chemical agents.

Energy-conversion device: Thermal-electric energy conversion devices based on diamond/carbon vacuum field emitter nanostructures can provide power and cooling systems that are more efficient, clean and environmentally friendly.

Electron emission devices: New cold-cathode electron emitters and gated field emission devices could improve performance, efficiency and reliability in advanced electronics. Infrared-emission displays can be used in infrared imaging and sensing equipment. These materials may also be useful for medical, biological and chemical applications.

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The original release can be found here.