Pioneering Nanotechnology Applications

Research in electronics and nanotechnology provides the foundation for a broad range of advances in many applications. Georgia Tech has become a national leader in both of these fields as a pioneering technology research university. Represented here is a snapshot of some of the micro- and nano-research currently being developed at Georgia Tech with support from IEN.

Nanomaterials & Nanostructures

> Nanoscale Semiconducting Graphene Solutions
Researchers at Georgia Tech have produced a revolutionary, semiconducting form of graphene. This semiconducting graphene can operate at temperatures above 200°C and is easily scalable to industrial fabrication.

Micro & Nano Electronic Systems & Components

> Ultra-Broadband Wireless Micro-antenna Research
Using the folk-art tradition of origami, researchers at the Georgia Electronic Design Center are creating self-reconfigurable compact and highly efficient micro-antennas and electronics for ultra-broadband wireless and sensing applications. The self-activation reconfiguration features allow for cognitive electronics that respond to real-time conditions.

Biomedical Materials & Devices

> Microneedles for Virtually Painless Drug Delivery
Georgia Tech researchers have made immense advancements in the development of microneedles for vaccination and insulin delivery. Future uses of these microneedles being explored include minimally invasive drug delivery to treat macular degeneration and other retinal diseases and usage to deliver proteins, DNA and other molecules into cells.

Semiconductor Materials, Processes & Devices

> Wide-bandgap Semiconductor Technologies
Wide-bandgap semiconductor technologies have actively been sought as the next generation semiconductors due to their inherent wide bandgap, high electron saturation velocity, high thermal conductivity and wide temperature operation range capabilities.
MEMS Technologies

> **MEMS Gyroscopes**

Georgia Tech, in partnership with Northrop Grumman, has developed miniature navigation grade gyros for use in personal navigation, unmanned vehicle navigation, GPS denied or challenged locations, and other size and power constrained applications requiring precision navigation.

Micro & Nano Electronic Systems & Components

> **Organic Interposers for High Performance and Mobile Electronics**

Researchers at the Packaging Research Center are developing the 2nd generation of low-cost organic packaging solutions with a focus on ultra-miniaturization and high performance by decreasing thickness and improving lithographic ground rules below 5μm and bump pitch to 50μm. The team is also developing thinner packaging for mobile applications and logic processors with built in vias for 3D of embedded ICs for very high I/Os to achieve increased bandwidth compared to PoP stacking.

Optics & Photonics

> **Photoluminescent Disease Detection and Targeting Using Quantum Dots**

Researchers at the Georgia Institute of Technology have developed an easier and faster method to detect types of target molecules by embedding fluorescent quantum dots and magnetic iron oxide nanoparticles inside silica beads to create beads with a unique optical signature. Having different color beads allows the researchers to detect several target molecules at the same time in the same sample. Applications for this new technology include detecting cancer and neurological diseases by identifying certain molecules present in human blood or urine that indicate specific diseases.

Photovoltaics

> **3D Solar Cells**

IEN researchers have made a breakthrough for the solar industry by engineering fiber optic solar cells that can work indoors or underground. The new fiber optic solar cells use fiber optics to generate electricity which may potentially replace the traditional solar panels found on roofs.