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STEVENS
Institute of Technology

Research & Entrepreneurship Day
2009

- We are exploiting nanoscale devices based on carbon nanotube and graphene.
- Overcoming the technical challenges will enable one to leverage the outstanding properties of CNT and graphene in the development of next-generation devices with unrivaled functionality.
- Such capabilities show potential widespread application in areas such as sensors, actuators and nanoelectronics systems.

Centimeters² area
With 10 nm feature size

High throughput
High resolution
1-step patterning in large areas

Graphene Layer
Oxidation

Graphene Nanofabrication
*Provisional patent filed

Functionalized NW
CNT Manipulation

Multi-functionalized Nanowires and CNTs

Al
CNT 100 nm
Towards Nanoactuator Arrays

Nanoactuators and Nano-antenna Arrays

Catalyst tip
Graphene Quantum Dot
1-D array of CNT quantum dots
CNT segmented

CNT and Graphene Quantum Dot Single Electron Transistors

Nanoelectronic Devices Based on Low Dimensional Materials such as Carbon Nanotube, Graphene and Functionalized Nanowires

Graphene
 $\ln(I/V)$
 I/V
 $12.1V$
 $\ln(I/V) = -21.7(I/V) - 93.5$

Graphene Vacuum Electronics
*Provisional patent filed

Piezoelectric Microvalve for NASA's Mass Spectrometer

Deformable Mirror for NASA's Adaptive Optics in Space

Graphic Courtesy: Prof. Search, Stevens (Physics)

Graphene rings
Graphene oxide bumps on highly pyrolyzed ordered graphite.

Nanofabrication of Graphene Electron Interferometer
*Provisional patent filed

Collaborators

Strauf, Fisher, Wang, Choi, Shi, Search, Liang, Besser, Manoochchri (Stevens); Choi (U. Idaho); Jiang (TRIS); Getty, Li (NASA/GSFC); Huang (U. Arkansas); Lee (KAIST); Yee (NASA/JPL); Su (NASA/LaRC); Wick (Sandia National Lab); Khodadadi (Auburn); Trolrier-McKinstry (PSU); Fink (Caltech)

