THE CINCINNATI SMART STRUCTURES BIO-NANOTECHNOLOGY LABORATORY

Nanotube Synthesis

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(http://www.min.uc.edu/~mschulz/smartlab/smartlab.html)

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MISSION STATEMENT

The SSBN Lab develops innovative smart materials, sensors, and active devices by intersecting the disciplines of engineering, nanotechnology, and biomedicine. The SSBN Lab is comprised of a Nanotube Synthesis Lab, a Nanoscale Materials Processing Lab, and a Smart Structures and NanoDevices Lab. The SSBN Lab is an exciting interdisciplinary learning environment for UG through Ph.D. level students.

RESEARCH COMPETENCIES

**Smart Structures.** Smart structures contain sensors, actuators and artificial intelligence and can respond in a human-like way to counteract loads, reduce vibration, change shape, and prevent their own degradation. Piezoelectric Active Fiber Composite sensors/actuators are built at the UC for use in smart structures. “Structural Health Monitoring: An International Journal” is managed from this laboratory.

**Biomimetics.** This is the development of smart structures based on the principles of mimicking the structure and function of biological systems. An Artificial Neural System using continuous neuron sensors is being developed and commercialized for the real-time monitoring of acoustic emissions and dynamic strains generated by damage growth in large composite and metallic structures.

**Nanotechnology.** Nanotechnology is the application of nanoscale materials. Nanocomposite materials are being developed that are self-sensing and self-actuating to improve the strength, reliability, and performance of mechanical and aerospace structures and systems. The Nanotube Synthesis Laboratory provides the raw materials (carbon nanotubes) needed to develop Smart Nanocomposite Materials.

**Bio-Nanotechnology.** This is the logical integration of Nanoscale Precision with biomedicine. We are designing smart material systems and biosensors that may be highly sensitive and selective detectors of cancer, other diseases, and chemical agents.
1. Carbon Nanotube Synthesis
Catalysts and Substrates for SWCNT Growth

(a) Catalysts
1. FirstNano liquid catalyst
2. UC- powder catalyst
3. Patterned silicon chip
4. Bulk SWCNT

(b) Molybdenum boat

(c) UC Fixture for growth experiments
ESEM Images of as Grown (left) and Purified Nanotubes (center and right)

TEM Images (rope left and coil right)