Measurement Facilities:
Biological Materials and Biomaterials

The Materials Reliability Division has established several capabilities for measuring the interaction of living cells and tissues with biomaterials and the reliability of those biomaterials. These include the ability to culture cells, handle tissues, and employ a wide range of biological assays. In addition, we have applied our expertise in conventional materials measurements to biology, developing custom instrumentation to measure response from the macro- to the nano-scale.

Cell Culture Laboratory

Our cell culture laboratory contains all of the features needed for maintaining cell lines and handling biological tissue samples: biological safety cabinets, refrigerators, low temperature freezer, cryogenic storage, incubators, centri-fuge, plate reader, optical microscopes, etc. Several cell lines have been established including fibroblasts, adrenal cells, and vascular smooth muscle cells, among many others.

A biological safety cabinet used for cell culture.

Bio-Electronics Reliability Testing

In support of the active implantable device industry, we have an electronic reliability laboratory that is complete with environmental chambers, optical inspection equipment, and multiplexed electronics for accelerated life testing of discrete electronic components. An ultrasonic resonance system is available to measure the structural integrity of these components. This lab is also outfitted with simulated anatomical fluid baths for testing conformally coated electronics.

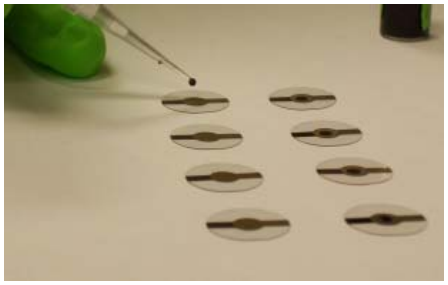
An environmental chamber used for accelerated tests of bio-electronic components.

Tissue Engineering

We have the necessary equipment to manufacture hydrogel scaffolds for tissue engineering. In addition, we have custom bioreactors capable of measuring material properties of the tissue engineered constructs on-line. A scanning electrochemical microscope is capable of measuring cell metabolism in complex systems.

Nanoparticle Characterization

Facilities exist to characterize nanoparticles before and during the time they come into contact with cells or tissue engineered constructs. We can also functionalize nanoparticles by tuning the surface chemistry of the particles. Equipment that is used to characterize the nanoparticles includes a thermogravemetric analyzer, a transmission electron microscope, a field emission electron microscope, and a combined instrument that measures the size and zeta potential of nanoparticles. We also have a range of custom quartz crystal microbalance instruments. Here we can measure nanoparticles alone, in cell culture, and while immersed in a flowing fluid, all at a range of temperatures.



Quartz crystals being coated with carbon nanotubes

FACILITIES