

Nanotechnology Research Center

Marcus Nanotechnology Building Organic Cleanroom Tools

As part of the new capabilities of the Marcus Nanotechnology Building, the NRC has recently acquired and installed new analysis, characterization, and fabrication tools in the organic cleanroom.

Surface Patterning: The [Bioforce Nano eNabler](#) is a multifunctional platform for dispensing attoliter to femtoliter volumes (1-50 μm spots) of biomolecules, nanoparticles and other liquids onto a wide variety of surfaces with 20 nm stage resolution and 50 mm XY travel. It is faster and more flexible than conventional pin spotting technologies, and has no clogging or misalignment problems, as well as multiplexing ability.



Ink Jet Printing: The [Microfab jetlab II](#) table-top ink-jet microdispensing and printing tool is useful for a wide variety of applications. Typical “inks” include nano-silver, adhesives, polymers, and biological materials, including proteins and nucleic acids. As a non-contact printing process, the accuracy of ink-jet dispensing is not affected by how the fluid wets a substrate, and the fluid source cannot be contaminated by materials on the substrate. In addition, the ability to free-fly fluid droplets allows the fluid to be dispensed into and onto non-planar and complex structural features.



Quartz Crystal Microbalance with Dissipation (QCM-D): The [Q-Sense E4](#) system is a four module instrument used to measure bulk-surface interactions for materials, chemistry, and life sciences research. A wide range of crystal surfaces are available for flexible immobilization of proteins, nucleotides, cells, and polymers. The provided modeling and analysis software enables quantification of viscosity, elasticity, and thickness of any soft film, while reaction kinetics can be extracted as well.



Surface Plasmon Resonance (SPR): The [Biacore T200](#) is a versatile, label-free system for detailed studies of biomolecular interactions. With exceptional sensitivity, this system provides high quality kinetics from the fastest on-rates to the slowest off-rate. The system is automated and can process up to 384 samples in unattended runs. **COMING SOON**



Nanoparticle Characterization: The [Malvern Instruments' Zetasizer ZS](#) measures particle size (0.3 nm to 10 μm) via Dynamic Light Scattering with backscatter optics, Zeta potential, and molecular weight (as low as 342 Dalton). Aqueous and organic solvents can be used, with samples as small as 12 μl , and controlled temperature (0-90 $^{\circ}\text{C}$). **COMING SOON**



Dynamic Contact Angle: The [ramé-hart Model 250](#) goniometer is a software-driven instrument providing automated digital contact angle measurements. This instrument has been furnished with a 4" rotating wafer support stage and automated tilting base option. This tool is also a tensiometer and has an advanced software version for surface energy measurements as well as surface tension and dynamic studies. Advancing and receding contact angles are readily determined by inclining the substrate and allowing the drop to deform due to gravity



Variable Pressure Scanning Electron Microscopy: The [Hitachi S3700N](#) Variable Pressure SEM (with Oxford EDX) features a low vacuum observation of 6–270 Pa (7mT-2Torr) which enables imaging of non-conductive samples (dielectrics) and wet/moist samples, without traditional sample preparation (gold coating/drying). A Deben Coolstage controls sample temperature between -10F and 120F to control sample vapor pressure. Resolution is 4 nm in low vacuum (6 Pa) mode using the BSE detector.



X-Ray Photoelectron Spectrometer (XPS): The [Thermo Scientific K-Alpha](#) is a fully integrated, monochromated small-spot XPS system. The K-Alpha carries out both large and small feature analyses. For small feature analysis and XPS mapping, the monochromated X-ray beam may be focused into a small spot providing an ultimate lateral resolution of 30 μm . A high-flux, low-energy ion source is integral to K-Alpha for depth profiling. Low energy sputtering combined with azimuthal rotation produces profiles with excellent depth resolution.



Laser Confocal Microscope: The [Olympus LEXT OLS4000](#) is designed for nanometer level imaging and measurement with magnification ranges from 108x – 17,280x. The versatility of the system provides all of the microscopy techniques combined with the added power of confocal so that any sample can be accommodated with no sample preparation. Contains seven measurement modes: step, area/volume, surface roughness, geometric, particle, film thickness, and auto edge detection measurements.



Supporting equipment in the Marcus organic cleanroom includes UV-Vis spectrophotometer, CO₂ incubators, microcentrifuge, microbalance, ultrasonic baths, vortex mixer, orbital shaker, autoclave, chemical fume hoods, and biosafety cabinets (BSL-2).

For more information about these tools and how to get access, contact David Gottfried or Ross Hutchison:

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