The University of Akron
School of Polymer Science and Polymer Engineering

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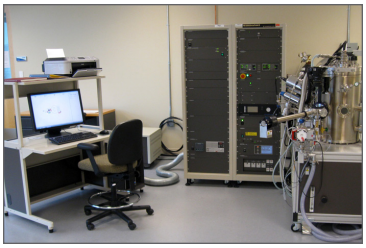
MATERIALS CHARACTERIZATION

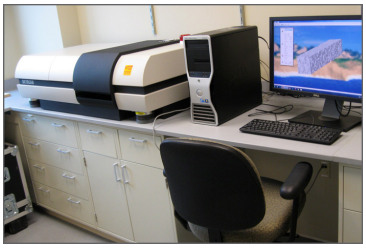


X-RAY PHOTOELECTRON SPECTROMETER (XPS)

- X-Ray Photoelectron Spectroscopy (XPS) is one of the most extensively used analytical techniques due to its ability to analyze with high sensitivity the elemental composition and chemical bonding in the top 10 nm near the surface of the specimen
- Applications: polymers, metals, ceramics, catalysts, corrosion, biomaterials, adhesion, semiconductors, dielectric materials electronics packaging, magnetic media, thin film coatings

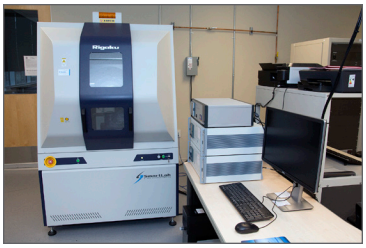
ATOMIC FORCE MICROSCOPE (AFM)

- Three-dimensional surface topographic imaging. Imaging surface roughness, electrical conductivity, capacitance, mechanical parameters (modulus, hardness) and magnetic properties are possible
- Applications: imaging of thin films and coatings, nanostructures, batteries and energy storage, biocompatibility, corrosion and antifouling, data storage, optics, photovoltaics, semiconductor and microelectronic devices, sensors and actuators, tribology (hardness, lubrication, and wear). Imaging the structure of biological molecules, cellular components, cells or tissues



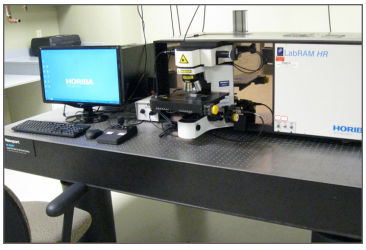
MICRO COMPUTED TOMOGRAPHY (MICRO CT) SCANNER

- X-ray micro computed tomography (Micro CT) is a technique used to nondestructively characterize material microstructure in three dimensions with micron level spatial resolution
- Provides stunning real 3D images for all materials and samples based on absorbing x-ray radiation
- Applications: biomedical research, material science, polymer science, pharmaceutical drug development and manufacturing, composites, dental research, electronic components, geology, zoology, botany, building materials, paper manufacturing



X-RAY DIFFRACTOMETER (XRD)

- X-Ray Diffraction (XRD) is a non-destructive analytical technique providing information about crystal structure, chemical composition and physical characteristics of materials and thin films
- Applications: identification and quantification of the crystalline phase, thin film thickness measurements, corrosion, nanomaterials, powders, materials for tribological control, biomaterials, thin polymer films, thin film multilayers, patterned films



RAMAN SPECTROMETER

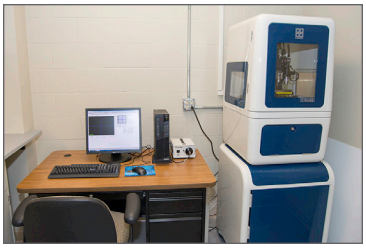
- Raman Spectroscopy is a non-destructive analytical technique which uses laser Raman scattering to provide detailed information about chemical structure, phase and polymorphism, crystallinity and molecular interactions. No sample preparation for liquids, powders and films
- Two research grade confocal Ramans with complementary capabilities. No sample prep required
- Applications: nanomaterials, carbon materials, graphene, polymers, corrosion, pharmaceuticals, semiconductors, forensics, biology and medicine, environmental studies

SMALL ANGLE X-RAY SCATTERING (SAXS)

- Structure analysis of condensed matter using scattering of a focused x-ray beam after passing through the sample. Yields information on the sizes or shapes of particles with characteristic dimensions of up to 100 nm, and on the internal structure of disordered or partially ordered systems
- Applications: polymer gels and soft materials, biocompatible polymers, pharmaceutical materials (drug delivery), food (emulsifiers and stabilizers), nano-sized inorganic particles in cosmetics, paints or ceramics, nanocomposites, liquid crystals, proteins, biological membranes, building materials

SCANNING AUGER NANOPROBE (SAN)

- Auger Electron Spectroscopy is the most widely used technique for surface analysis of conductive samples. Provides elemental information about the first ten atomic layers of the sample
- Unique capability of high resolution SEM imaging combined with Auger elemental analysis and mapping in the nanometer range. Elemental depth profiles are a distinct advantage of the system
- Applications: thin film and interfacial composition, failure analysis, information on the bonding state of metals and alloys, analysis of interface boundaries (alloys and coatings), materials for reducing friction, lateral composition uniformity in thin films

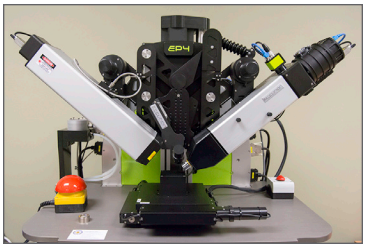


NANOINDENTER/NANOSCRATCH SYSTEM

- Quantitatively characterize the mechanical properties of small volumes of material. Properties such as elastic modulus, hardness, creep, stress relaxation, and fracture toughness measured at the nanoscale and microscale. Nanoscratching uses lateral force to probe coatings and film adhesion
- Applications: characterization of organic, inorganic, soft or hard materials and coatings such as thin and multilayer films, photoresists, paints and coatings, pharmaceuticals, metals and metal oxides, electronic/solar/semiconductor, polymers, glasses, ceramics, composites, biomaterials

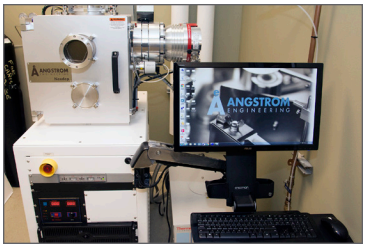
CONFOCAL LASER SCANNING MICROSCOPE

- High resolution in-focus optical images from selected depths of transparent objects. 3D images.
- Applications: colloidal dispersions, biological tissue imaging, biofilms, phase separation in binary polymer mixtures, micro-visualization of corrosion



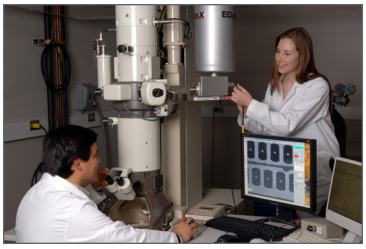
IMAGING ELLIPSOMETER

- Ellipsometry measures changes in the polarization state of light when the beam is reflected from a surface. Provides material dependent images based on changes in light polarization across a sample.
- Applications: structure of organic coatings and changes due to corrosion, changes in coatings with exposure to humidity and environmental aging, graphene, polymers, solar cells, nanoparticles, hydrogels, self-assembled monolayers (SAMs)



THIN FILM DEPOSITION SYSTEM

- Physical vapor deposition of thin films (thermal and by sputtering): metals, alloys, oxides
- Precision control of film thickness with quartz crystal sensors
- Performed in high vacuum for film purity
- Applications: well-defined planar metal films for corrosion studies, studies of interfacial interactions, and protective polymer coatings, deposition on various types of substrates, including polymers



ADDITIONAL CHARACTERIZATION TECHNIQUES AVAILABLE:

- Electron Microscopy – SEM, TEM
- NMR – Solution & Solid State; Proton & Carbon
- Chromatography (GPC, GC, HPLC)
- Spectroscopy (FT-IR, UV-vis, Fluorescence)
- Thermal Analysis (DSC, TGA, DMA)
- Rheology (Rotational, Capillary)
- Mechanical Testing (Tensile, Bending, Impact)

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