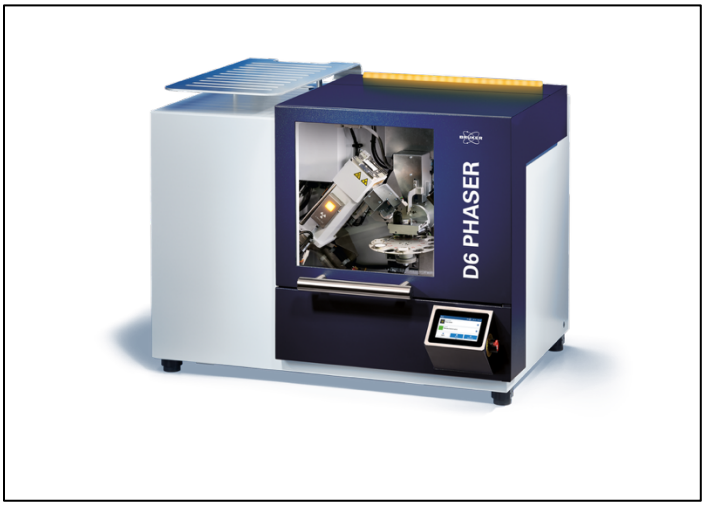
Faculty Research Lab

(Physics & Chemistry)

University of South Carolina Aiken

1. Bruker D6 Phaser X-Ray Diffractometer (XRD)



Description

The Bruker D6 Phaser is a compact benchtop X-ray diffractometer used for crystallographic analysis and phase identification of solid materials. The system enables researchers to determine crystal structure, phase composition, and lattice parameters for a wide range of inorganic and organic materials.

Capabilities

- Copper X-ray source with high stability
- Silicon strip detector for high-resolution diffraction data
- Angular measurement range from −3° to 152° (2θ)
- Automated sample alignment and measurement
- Integrated analysis software for diffraction pattern interpretation

Applications

- Crystal structure identification
- Phase analysis of engineering and chemical materials
- Thin film and powder diffraction studies
- Materials science and solid-state chemistry research

2. Agilent Gas Chromatography–Mass Spectrometry (GC-MS)

Description

The Agilent GC-MS system combines gas chromatography with mass spectrometry to separate, identify, and quantify volatile and semi-volatile chemical compounds in complex mixtures.

Capabilities

- High-resolution gas chromatographic separation
- Mass spectral detection for compound identification
- Automated sample injection
- Integrated spectral libraries for compound analysis

Applications

- Environmental contaminant analysis
- Pharmaceutical and biochemical analysis
- Chemical composition identification
- Trace compound detection in research samples

3. Renishaw inVia Raman Microscope

Description

The Renishaw inVia Raman Microscope is a high-resolution Raman spectroscopy system used for molecular and structural characterization of materials at microscopic scales.

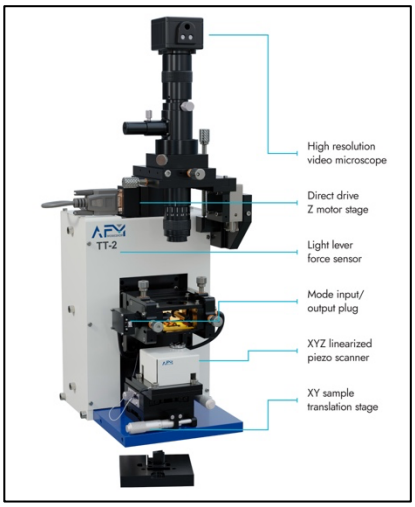
Capabilities

- High-sensitivity Raman spectral detection
- Confocal microscope integration for spatial analysis
- Multiple excitation laser options
- High spectral resolution and rapid data acquisition

Applications

- Molecular structure identification
- Chemical composition analysis
- Semiconductor and nanomaterial characterization
- Pharmaceutical and polymer research

4. Tabletop Atomic Force Microscope (AFM)



Description

The Tabletop Atomic Force Microscope is a scanning probe microscope used to measure surface topography and nanoscale features of materials with extremely high resolution.

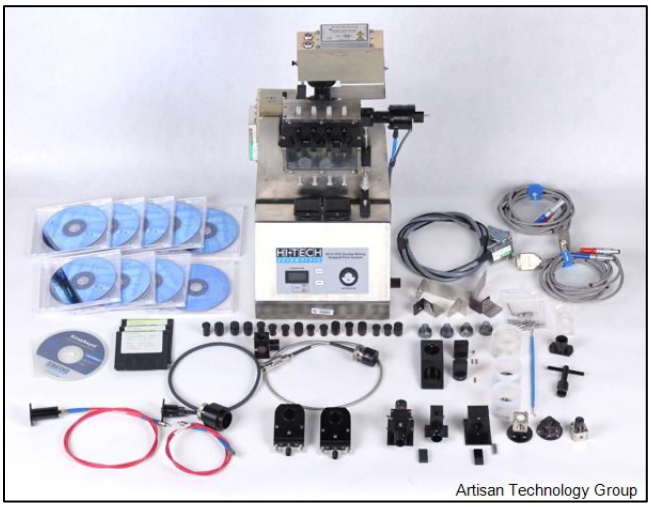
Capabilities

- Nanometer-scale surface imaging
- Contact and non-contact scanning modes
- High-precision cantilever sensors
- Digital surface mapping and analysis

Applications

- Nanomaterials characterization
- Surface morphology analysis
- Thin-film research
- Semiconductor and materials science studies

5. KinetAsyst Stopped-Flow Spectrometer



Description

The KinetAsyst Stopped-Flow Spectrometer is designed to measure extremely fast chemical reactions by rapidly mixing reactants and monitoring changes in absorbance or fluorescence over very short time intervals.

Capabilities

- Millisecond reaction monitoring
- Rapid mixing of chemical reactants
- Dual optical detection channels
- Automated kinetic data acquisition

Applications

- Enzyme kinetics research
- Biochemical reaction analysis
- Pharmaceutical reaction studies
- Chemical kinetics experimentation

6. Thermo Scientific Nicolet 380 ATR-FTIR (Teaching FTIR)

Description

The Thermo Scientific Nicolet 380 ATR-FTIR Spectrometer is an infrared spectroscopy instrument used primarily for instructional laboratories to analyze molecular vibrations and identify chemical functional groups.

Capabilities

- ATR sampling accessory for solid and liquid samples
- Mid-infrared spectral analysis
- Rapid spectral acquisition
- User-friendly teaching interface

Applications

- Organic compound identification
- Functional group analysis
- Chemistry laboratory instruction
- Polymer and material characterization

7. Thermo Scientific Nicolet 4700 FT-IR Spectrophotometer (Research FTIR)

Description

The Thermo Scientific Nicolet 4700 FT-IR Spectrophotometer is a high-performance infrared spectroscopy system used for advanced molecular and structural analysis in research laboratories.

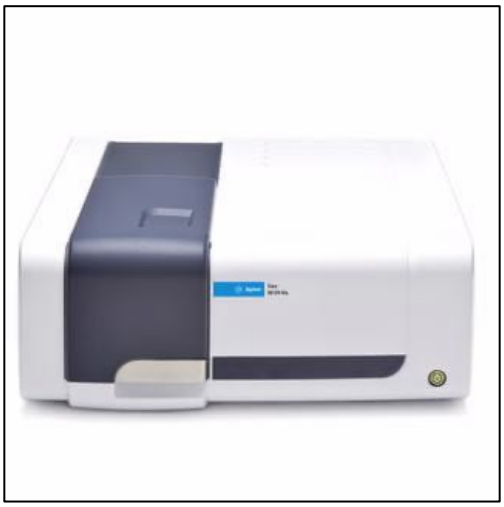
Capabilities

- High-resolution FT-IR spectral analysis
- Broad infrared wavelength detection range
- Modular accessory compatibility
- Advanced spectral processing software

Applications

- Molecular structure analysis
- Chemical reaction monitoring
- Polymer characterization
- Advanced materials research

8. Agilent Cary 60 UV-Vis Spectrophotometer



Description

The Agilent Cary 60 UV-Vis Spectrophotometer measures absorbance and transmittance of liquid samples across ultraviolet and visible wavelengths for quantitative chemical analysis.

Capabilities

- Wavelength range from 190 to 1100 nm
- Xenon flash lamp light source
- Rapid data acquisition
- High sensitivity for trace analysis

Applications

- DNA and protein quantification
- Chemical kinetics experiments
- Environmental analysis
- Pharmaceutical research

9. Agilent Cary 8454 UV-Vis Spectrophotometer

Description

The Agilent Cary 8454 UV-Vis Spectrophotometer is a diode-array spectrophotometer designed for rapid spectral analysis and monitoring of chemical reactions.

Capabilities

- Diode-array detection system
- Simultaneous multi-wavelength measurement
- Rapid full-spectrum acquisition
- Automated data analysis software

Applications

- Reaction monitoring
- Quantitative chemical analysis
- Spectroscopic research studies
- Environmental and pharmaceutical testing

10. Anasazi Eft-60 Nuclear Magnetic Resonance (NMR) Spectrometer

Description

The Anasazi Eft-60 NMR Spectrometer is an analytical instrument used to determine the molecular structure and chemical composition of organic compounds through nuclear magnetic resonance spectroscopy.

Capabilities

- High-field NMR analysis
- Digital spectral acquisition and processing
- Automated sample analysis
- High-precision frequency stability

Applications

- Molecular structure determination
- Organic compound identification
- Chemical synthesis verification
- Pharmaceutical and biochemical research

11. Buehler MetaServ250 Metallographic Grinder/Polisher

Description

The Buehler MetaServ250 is a metallographic preparation system used to grind and polish material samples to produce smooth surfaces suitable for microscopic and structural analysis.

Capabilities

- Variable speed grinding and polishing
- Automated polishing controls
- Multi-sample preparation capability
- Durable industrial design

Applications

- Metallurgical sample preparation
- Microstructure analysis
- Materials science research
- Quality control testing

12. Film Sense Multi-Wavelength Ellipsometer

Description

The Film Sense Multi-Wavelength Ellipsometer is an optical instrument used to measure thin-film thickness and optical properties of materials using polarized light analysis.

Capabilities

- Multi-wavelength ellipsometry measurements
- High-precision thin film thickness measurement
- Automated optical property analysis
- Computer-controlled measurement software

Applications

- Thin film characterization
- Semiconductor research
- Nanotechnology studies
- Materials science analysis

13. Glancing Angle Deposition (GLAD) System

Description

The Glancing Angle Deposition System is a thin-film fabrication system used to create nanostructured coatings through controlled vapor deposition at oblique angles.

Capabilities

- Controlled deposition angles
- Thin-film growth monitoring
- Vacuum deposition environment
- Adjustable substrate positioning

Applications

- Nanostructured material fabrication
- Thin-film optical coatings
- Semiconductor device research
- Advanced materials development

14. Harrick PDC Plasma Cleaner

Description

The Harrick PDC Plasma Cleaner is a plasma surface treatment system used to clean and activate surfaces prior to thin-film deposition or bonding processes.

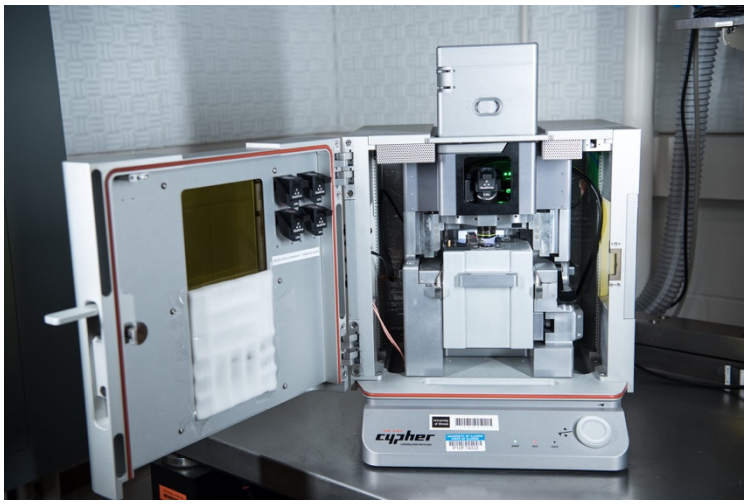
Capabilities

- Radio-frequency plasma generation
- Surface contamination removal
- Adjustable plasma exposure parameters
- Compact benchtop design

Applications

- Surface cleaning for microscopy samples
- Semiconductor device preparation
- Surface modification research
- Materials science experiments

15. ISCPS Corp nGauge Atomic Force Microscope



Description

The ISCPS nGauge Atomic Force Microscope is a high-precision scanning probe microscope used to characterize nanoscale surface structures and material properties.

Capabilities

- Nanometer-scale imaging resolution
- Multiple scanning modes
- High-precision cantilever detection
- Digital surface reconstruction software

Applications

- Nanotechnology research
- Surface roughness analysis
- Thin film characterization
- Semiconductor device analysis

16. Varian CP-3380 Gas Chromatograph

Description

The Varian CP-3380 Gas Chromatograph is an analytical instrument used to separate and analyze volatile compounds in complex mixtures. It employs gas chromatography to separate components based on their interactions with a stationary phase inside a capillary column.

Capabilities

- Compatible with multiple detectors such as FID, TCD, and ECD
- High-resolution capillary column separation
- Automated temperature programming
- Computer-controlled data acquisition and analysis

Applications

- Environmental contaminant analysis
- Pharmaceutical compound identification
- Petrochemical analysis
- Chemical mixture characterization

17. Mbraun Labstar Glovebox

Description

The Mbraun Labstar Glovebox is a controlled-atmosphere enclosure designed for handling air-sensitive materials in an oxygen- and moisture-free environment.

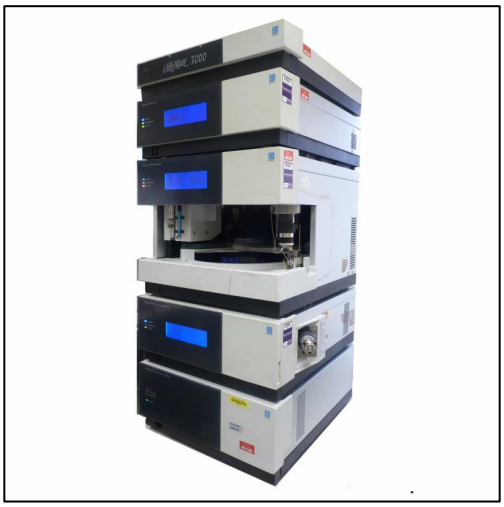
Capabilities

- Integrated gas purification system
- Low oxygen and moisture atmosphere control
- Dual glove ports for sample manipulation
- Real-time monitoring of environmental conditions

Applications

- Handling air-sensitive chemicals
- Materials synthesis and preparation
- Battery and semiconductor research
- Controlled environment experiments

18. Dionex UltiMate 3000 UHPLC System



Description

The Dionex UltiMate 3000 Ultra-High-Performance Liquid Chromatography (UHPLC) system is used for separating, identifying, and quantifying compounds in liquid samples with extremely high resolution.

Capabilities

- High-pressure liquid chromatography operation up to ~1000 bar
- Automated sample injection and solvent delivery
- High-resolution separation columns
- Integrated software for data processing and analysis

Applications

- Pharmaceutical compound analysis
- Environmental sample testing
- Biomolecule separation and analysis
- Chemical reaction monitoring

19. Pine Bipotentiostat (Model AFCBP1)

Description

The Pine Bipotentiostat is an electrochemical instrument used to control and measure voltage and current in electrochemical experiments involving two working electrodes.

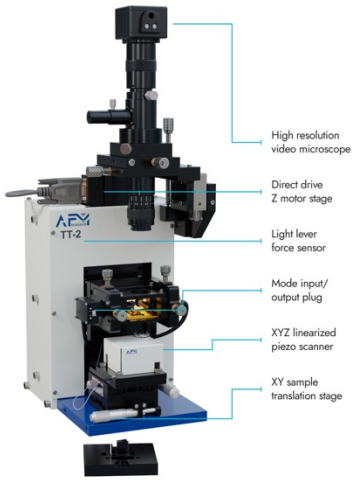
Capabilities

- Potentiostatic and galvanostatic control modes
- High-precision voltage and current measurement
- Compatible with multiple electrochemical cells
- Integrated electrochemical data analysis software

Applications

- Electrochemical reaction analysis
- Corrosion studies
- Battery and fuel cell research
- Electrochemical sensor development

20. Table Top Atomic Force Microscope



Description

The Table Top Atomic Force Microscope is a compact scanning probe microscope used to analyze surface topography and nanoscale properties of materials.

Capabilities

- Nanometer-scale surface imaging
- Contact and tapping scanning modes
- Digital surface mapping software
- Compact benchtop instrument design

Applications

- Surface morphology characterization
- Nanomaterials research
- Thin film analysis
- Materials science and semiconductor research

21. HC-E1 Sumitomo Cryostat

Description

The HC-E1 Sumitomo Cryostat is a cryogenic cooling system used to maintain extremely low temperatures for experiments requiring cryogenic environments.

Capabilities

- Temperature control down to approximately 1.5 K
- Stable cryogenic cooling environment
- Compatible with various sample holders
- Automated temperature monitoring and control

Applications

- Superconductivity research
- Low-temperature physics experiments
- Quantum materials research
- Cryogenic material characterization

22. Muffle Furnace – KSL-1200X

Description

The KSL-1200X Muffle Furnace is a high-temperature laboratory furnace used for thermal processing, heat treatment, and material sintering.

Capabilities

- Maximum temperature up to approximately 1200 °C
- Programmable temperature control
- Uniform heating chamber
- Durable high-temperature insulation

Applications

- Heat treatment of materials
- Ceramic sintering
- Thermal decomposition experiments
- Materials science research

23. Heidolph Rotary Evaporator

Description

The Heidolph Rotary Evaporator is a laboratory instrument used to remove solvents from samples through controlled evaporation under reduced pressure.

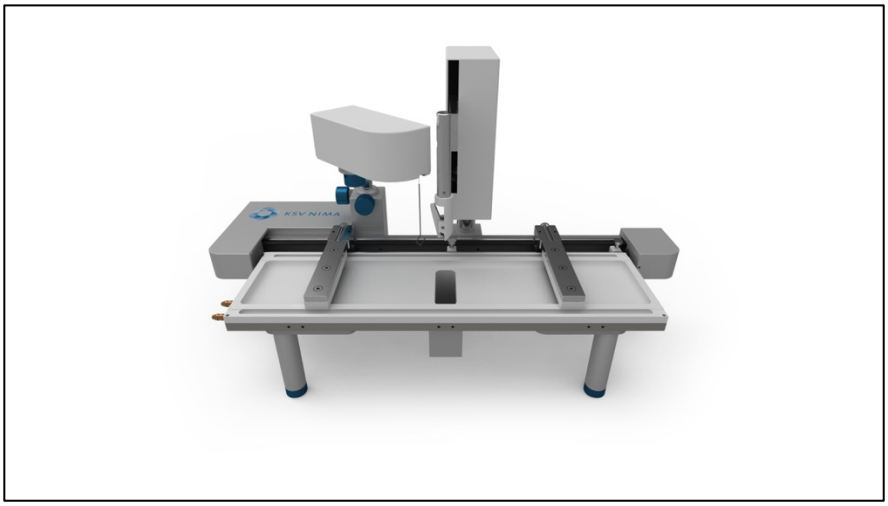
Capabilities

- Adjustable rotation speed for efficient evaporation
- Vacuum-assisted solvent removal
- Controlled heating bath for temperature regulation
- Compatible with multiple glassware configurations

Applications

- Solvent evaporation and concentration
- Chemical synthesis purification
- Natural product extraction
- Pharmaceutical sample preparation

24. Nima Technology Langmuir-Blodgett Trough



Description

The Nima Technology Langmuir-Blodgett Trough is an instrument used to create and study thin molecular films at the air-water interface.

Capabilities

- Controlled monolayer film deposition
- Precision barrier movement for surface pressure control
- High-accuracy film transfer onto substrates
- Integrated software for experimental control

Applications

- Thin-film fabrication
- Nanomaterial research
- Surface chemistry studies
- Sensor and device development

25. Horiba DeltaPro Lifetime Fluorimeter

Description

The Horiba DeltaPro Lifetime Fluorimeter is an advanced fluorescence spectroscopy system used to measure fluorescence lifetimes and molecular interactions.

Capabilities

- Time-correlated single photon counting (TCSPC) detection
- Picosecond to nanosecond lifetime measurement
- High sensitivity fluorescence detection
- Modular optical configuration

Applications

- Fluorescence lifetime analysis
- Molecular interaction studies
- Biophysics and nanomaterial research
- Photophysics and photochemistry experiments

26. Thermo Scientific Barnstead Smart2Pure Water Purifier

Description

The Thermo Scientific Barnstead Smart2Pure Water Purifier provides high-purity laboratory water for analytical experiments and sample preparation.

Capabilities

- Produces Type 1 and Type 2 purified water
- Integrated UV purification system
- Ion-exchange and filtration purification stages
- Digital monitoring of water quality

Applications

- Preparation of analytical samples
- Laboratory reagent preparation
- Instrument feed water supply
- Chemical and biological experiments

27. StellarNet Fluor-System Fluorescence Spectrometer

Description

The StellarNet Fluor-System Fluorescence Spectrometer is a compact spectroscopic instrument used to measure fluorescence emission from chemical and biological samples.

Capabilities

- Broad excitation and emission wavelength detection
- High sensitivity fluorescence measurement
- Portable spectrometer design
- Integrated spectral analysis software

Applications

- Fluorescence spectroscopy analysis
- Environmental monitoring
- Biochemical research
- Quantitative fluorescence measurements