



### Equipment Available for Industry Use:

### **Chemistry and Biochemistry**

http://www.chem.ucsb.edu/

#### Mass Spectroscopy Facility

http://www.chem.ucsb.edu/~massspec/ Facility Manager: Dr. James Pavlovich (pavlovich@chem.ucsb.edu)

#### Instruments:

- □ VG70 Magnetic Sector
- Micromass QTOF2 Quadrupole/Time-of-Flight Tandem mass spectrometer
- PE Sciex QStar quadrapole/time-of-flight tandem mass spec
- □ GC/MS instruments

#### **NMR Facility**

http://www.chem.ucsb.edu/~nmr/ Facility Manager: Ata Shirazi (shirazi@chem.ucsb.edu)

Instruments:

- Varian UNITY INOVA 500 MHz NMR Spectrometer
- Varian UNITY INOVA 400 MHz NMR Spectrometer
- Varian MERCURY Vx 200 MHz NMR Spectrometer

### **Optical Characterization Facility**

http://www.chem.ucsb.edu/~ocf/ Facility Manager: Alexander Mikhailovsky (mikhailovsky@chem.ucsb.edu)

Instruments:

Laser

- Spectraphysics Tsunami
  - Broadband tunable femtosecond Ti:Sapphire laser
- □ Spectraphysics Spitfire

Chirped pulse Ti:Sapphire amplifier

- Spectraphysics Millenia-V
  - Diode pumped all-solid state continuous wave YAG:Nd laser
- Spectraphysics Evolution-X

Diode pumped all-solid state pulsed YAG:Nd laser

Spectraphysics Beamlock 2060





Ar-ion CW laser

Non-Linear Crystal

Using second harmonic generation in BBO crystals, output of the femtosecond lasers can be converted from IR to UV:

- □ 345-435 nm using output of Tsunami (~ 200 mW at 400 nm)
- □ 375-425 nm using output of Spitfire (~200 mJ/pulse at 400 nm)

Output of Spitfire can be used for generation of the femtosecond white-light continuum

2 nm crystalline sapphire plate pumped with 100 fs, 2 mJ pulse generates chirped continuum covering the range 430-700 nm

**Conventional Light Sources** 

Ocean Optics LS-1 tungsten lamp with near-black body emission spectrum (color temperature 3100 K).

**Beam Diagnostics Tools** 

- □ Single Shot Pulse Autocorrelator
  - Home-built instrument for measurements of the shape of femtosecond pulses
- Ocean Optics Portable Spectrometer USB2000

Palm-size portable spectrometer with USB computer interface for real-time spectral analysis

□ FGW Systems IR Viewer

Handheld IR viewer for visualization of weak or invisible beams.

Newport 1815-C Optical Power Meter

General purpose optical power meter with thermoelectric sensor.

#### Photodetectors

□ Hamamatsu R928 Photomultiplier Tube

High sensitivity/low noise analog PMT for measurements of the low intensity light

- Large area UV-enhanced Si photodiodes
  - Large (diameter 1 cm) generic Si photodiodes with enhanced response in UV range. The best choice for high intensity and low repetition rate measurements.
- Fast Si photodiodes with built-in preamplifiers

Fast preamplified Si-photodiodes are available in 100 MHz and 200 MHz versions.

These are typically used with high repetition rate systems.

#### Spectrometers

Acton Research SP300i spectrometer

Versatile, highly automated general purpose spectrometer

Acton Research SP500 spectrometer





Versatile, highly automated general purpose spectrometer. Good choice for simple Raman and fluorescence spectroscopy experiments.

Signal Processing Instrumentation

Stanford Research Systems SR830 DSP Lock-in Amplifier

Digital Signal Processor (DSP) based lock-in amplifier for the phase-sensitive signal detection. Ensures outstanding signal/noise ratio in measurements of low-level signals.

Stanford Research Systems SR570 Current Preamplifier
Low-noise current preamplifier for photodetectors (PMT, photodiodes) with variable sensitivity, bandwidth, and input bias current.

**Miscellaneous Equipment** 

- Newport ILS-200 Translation Stage
  - High-precision computer controlled linear translation stage.
- New Focus 5203 Optical Chopper Mechanical modulator for the laser beams. It is mostly used in the phase sensitive detection.
- Janis Research Inc. VPF-100 LN2 Cryostat

Cold finger liquid nitrogen cryostat for optical measurements with PID temperature controller.

### X-ray Analytical Facility

http://www.chem.ucsb.edu/~xray/ Facility Manager: Dr. Guang Wu (wu@chem.ucsb.edu)

Instruments:

- □ Single Crystal Diffraction
- Powder Diffraction

## **Chemical Engineering**

http://www.chemengr.ucsb.edu/

### Patrick Daughtery Lab

Contact: Patrick Daughtery (psd@engr.ucsb.edu)

#### Instruments

□ Fluorescence ActivatedCell Sorter (FACS)





## **Earth Science**

http://www.geol.ucsb.edu/

### **Electron Microscopy and Microanalysis Facility**

http://www.geol.ucsb.edu/research/labs\_equipment.html Contact: Dr. Gareth Seward (seward@geol.ucsb.edu)

Instruments:

Cameca SX50 electron probe microanalyzer (EPMA):
5 Wavelength dispersive X-ray spectrometers
Secondary and backscattered electron detectors
SiLi Energy dispersive X-ray analyzer (EDS)
Fully automated using Probe for EPMA on Windows XP
Over 100 standard reference materials
FEI Quanta 400 FEG environmental (ESEM):
Large range of electron detectors including SE, BSE, LFD, GSED, FSD
Panchromatic cathodoluminescence and scintillator BSE detector
High vacuum, low vacuum and environmental modes
Silicon drift detector EDS with INCA software
HKL electron backscatter diffraction system with integrated EDS
Nordlys S CCD diffraction camera
Channel 5 Acquisition and processing software
JEOL 6300 LaB6/W scanning electron microscope
Secondary and backscattered electron detectors
Panchromatic cathodoluminescence detector
SiLi EDS
Fully equipped sample polishing and preparation facility

### Mass Spectroscopy Facility LA-ICP-MS

http://www.geol.ucsb.edu/research/labs\_equipment.html Contact: Dr. Andrew Kylander-Clark (kylander@geol.ucsb.edu)

Instruments:

- Nu Instruments Plasma HR ICP-MS
  - 12 Faraday collectors and 4 discrete-dynode electron multipliers Geometry optimized for U/Th-Pb, Lu-Hf, and Si isotopes Desolvation nebulizer
- Nu Instruments AttoM elemental analyzer ICP-MS
  - Faraday collector and a discrete-dynode electron multiplier Fast scanning magnet
    - Desolvation nebulizer
- Photon Machines 200nm 140fs Ti:Sapphire laser





Short pulse duration for minimal heating and isotopic fractionation Photon Machines 193nm Excimer laser High pulse energy for increased ablation yield

## Materials Research Laboratory (MRL)

http://www.mrl.ucsb.edu/mrl/centralfacilities/index.html

### TEMPO - Thermal, Electronic, Elemental, Magnetic, Porosity, and Optical Facility

http://www.mrl.ucsb.edu/mrl/centralfacilities/chemistry/index.html Facility Director: Professor Ram Seshadri (seshadri@mrl.ucsb.edu) Facility Manager: Joe Doyle (jdoyle@mrl.ucsb.edu)

#### Instruments:

- Quantum Design Physical Properties Measurement System (PPMS)
- Quantum Design MPMS 5XL SQUID Magnetometer
- METTLER TGA/sDTA851e ThermoGravimetric Analyzer With Blazers ThermoStar 300 AMU Mass Spectrometer
- Bruker D8 Advance
- Inductively Coupled Plasma (ICP) Atomic Emission Spectrometer
- □ Shimadzu UV3600 UV-Nir-NIR Spectrometer
- Perkin Elmer LS 55 luminescence spectrometer
- Micromeritics Porosimiters
- MicroMeritics AccuPyc 1330 Pycnometer

### **Microscopy and Microanalysis Facility**

http://www.mrl.ucsb.edu/mrl/centralfacilities/microscopy/index.html

Facility Director: Professor James S. Speck (speck@mrl.ucsb.edu) Facility Managers: Dr. Tom Mates (mates@mrl.ucsb.edu)

Dr. Jin-Ping Zhang (jpzhang@mrl.ucsb.edu)

Dr. Jan P. Lofvander (lofvander@engineering.ucsb.edu)

Mark Cornish (cornish@engineering.ucsb.edu)

#### Instruments:

Transmission electron microscopes:

FEI Titan FEG High Resolution TEM/STEM and Analytical Microscope (in installation) FEI Tecnai G2 Sphera Microscope for Life Science Studies

FEI Tecnai G2 Sphera Microscope w/EDS for Materials Science Studies (Coming)

Scanning electron microscopes:

FEI XL40 Sirion FEG microscope w/EDS System

FEI XL30 Sirion FEG microscope

FEI Inspect S System w/CL System (coming)





#### Scanning probe microscopes (STM/AFM): Digital Instruments Multi-mode Nanoscope (2) Digital Instruments Dimension 3000 microscope Digital Instruments Dimension 3100 microscope Asylum MFP-3D SL System Asylum MFP-3D Bio System Secondary Ion Mass Spectrometry System: Physical Electronics 6650 Quadrupole X-ray Photoelectron Spectroscopy System: Kratos Axis Ultra w/UPS Capability Focused Ion Beam System: FEI Focused Ion Beam (Model DB235 Dual Beam) w/EDS System Instruments for Sample preparation: Gatan precision ion polishing system (Model 691) x2 Fischione ion polishing system (Model 1010) Allied MultiPrep polishing machine (Model 15-1000) Gatan dimple grinder (Model 650) Image Processing tools: Microtek ScanMaker i900 (6400x3200 DPI) Scanner Epson V700 Dual Lens Scanner for film/image digitization Electron microscopy simulation: Software for Scanning Electron Microscopy (SEM) Software for Transmission Electron Microscopy (TEM)

### **Polymer Characterization Facility**

http://www.mrl.ucsb.edu/mrl/centralfacilities/polymer/index.html Facility Director: Professor Craig Hawker (hawker@mrl.ucsb.edu) Facility Manager: Dr. Krystyna R. Brzezinska (kbrzez@mrl.ucsb.edu)

#### Instruments:

- □ Circular dichroism (CD)
- Differential Scanning Colorimetry (DSC)
- Light Scattering (DLS and SLS)
- Dynamic Mechanical Analyzer (DMA)
- GPC using DMF as a solvent
- GPC using THF as a solvent
- □ HPLC High Performance Liquid Chromatography
- Microwave Reactor
- Modulated Differential Scanning Calorimeter (MDSC) Q2000
- Preparative GPC
- □ Rheometer I (with water bath)
- □ Rheometer II (with oven)
- □ Wyatt GPC with MALS





#### Spectroscopy Facility

http://www.mrl.ucsb.edu/mrl/centralfacilities/spectroscopy/index.html Facility Director: Professor Song-I Han (songi@chem.ucsb.edu) Facility Manager: Dr. Jerry Hu (jghu@mrl.ucsb.edu)

Instruments:

- □ Nicolet Magna 850 IR/Raman
- Varian Cary Eclipse Fluorimeter
- Bruker DPX200 SB NMR for solution
- Bruker DSX300 WB NMR for solids
- Bruker DMX500 SB NMR for solution
- Bruker IPSO500 WB NMR for solids
- Bruker EMX Plus EPR Spectrometer

### X-ray Facility

http://www.mrl.ucsb.edu/mrl/centralfacilities/xray/index.html Facility Director: Professor Cryus R. Safinya (safinya@mrl.ucsb.edu) Facility Manager: Dr. Youli Li (youli@mrl.ucsb.edu)

Instruments:

- Philips XPERT Powder Diffractometer
- Bruker D8 Advance Power Diffractometer
- Panalytical MRD PRO Thin Film Diffractometer (I)
- Panalytical MRD PRO Thin Film Diffractometer (II)
- Small Angle X-ray Spectrometer (SAXS)
- □ Intermediate SAXS (2-Circle)
- □ Wide Angle X-ray (4-circle)
- Ancillary Equipment
- Confocal Microscope

## **Micro-Environmental Imaging & Analysis Facility**

http://www.bren.ucsb.edu/facilities/MEIAF/facility.html Donald Bren School of Environmental Science & Management <u>Contact: meiaf@bren.ucsb.edu or (805) 893-5892</u>

Instrument:

The core technology is an FEI Co. XL30 ESEM with a field emission gun (FEG). The ESEM detectors include a patented gaseous secondary electron detector (GSED), a solid-state backscattered electron detector (BSED), and a large field detector (LFD). The ESEM can be used as a conventional SEM (high vacuum mode) or as an environmental SEM (wet mode, i.e. moderate vacuum and moist





atmosphere).

## National Nanotechnology Infrastructure Network (NNIN)

http://www.nanotech.ucsb.edu/

Contact: Jack Whaley (whaley@ece.ucsb.edu) Contact Brian Thibeault (thibeault@ece.ucsb.edu)

#### Instruments:

Lithography

- High-resolution, direct write Electron Beam Lithography System
- Nanonex NX2000 Nanoimprinting System
- Deep UV Flood Exposer
- Mask Aligner / MJB 3 UV400 IR with back-side alignment
- Mask Aligner / MJB 3 UV400
- GCA AutoStep 200 i-line wafer stepper
- GCA 6300 i-Line Wafer Stepper
- Karl-Suss MA-BA-6 Mask/ Bond Aligner with backside optics
- □ Veeco Dimension 3100 Nanoman AFM-based Lithography tool
- FEI Sirion field-emission SEM with Nabity Pattern Generatory System
- 250 nm Pitch Interference Lithography System

#### Vacuum Deposition

- E-beam #1: Sharon Vacuum 4-pocket Electron Beam Evaporator (metals)
- □ E-Beam #2 Electron-Beam Evaporation System
- E-Beam #3 Load Locked Metal Evaporator Dual Gun (8 sources)
- E-Beam #4 CHA Muti-Wafer Metal Evaporator
- D PECVD Plasma Therm 790 for Oxides and Nitrides
- Unaxis High Density PECVD
- Sputtered Films DC/AC bipolar 3-chamber Reactive Sputtering System
- □ 3-source Solder Evaporator, Veeco VE-300
- 3-source research S-gun DC/Pulsed DC Reactive Sputtering System
- NRC 3117 3-source Thermal Evaporator
- □ Veeco Nexus Ion Beam Deposition Tool
- 6-source DC/RF magnetron sputter system

#### Etching

- RIE #1 Custom, Loadlocked Chlorine-Based System
- RIE #2 Methane / Hydrogen-Based System
- RIE #3 Fluorine-Based System MRC 51
- RIE #5 Programmable, Loadlocked Chlorine-Based System
- □ SiRIE ICP Based Flourine Etcher for Bosch MEMS Processes





- Technics PEII Plasma Etching Systems
- □ ICP#2 Panasonic Inductively Coupled Plasma Etcher Fluorine/Chlorine
- □ ICP#3 Unaxis ICP etching system with 200 C chuck Chlorine
- ICP#4 Panasonic Inductively Coupled Plasma Etcher Fluorine/Chlorine
- EVG Plasma Activation System

Test and Inspection

- □ FEI Sirion Ultra High Resolution Field-Emission SEM w/EDX
- □ Veeco Dimension 3100 Nanoman AFM
- □ Hitachi s2400 Scanning Electron Microscope
- □ Veeco Multimode Scanning Probe Microscope
- Various Optical Inspection Microscopes (5)
- Rudolph Auto-EL Ellipsometer
- Filmetrics White Light Reflection Dielectric Characterization tool
- Nanometrics 210 Reflectometer
- Dektak IIA Profilometer
- Probe Station with Curve Tracer
- Tencor Flexus 2320 Film Stress Measurement System
- Dektak VI Profilometer

**Thermal Processing** 

- M-8A Flip Chip Aligner Bonder
- □ Karl-Suss SB-6 Wafer Bonder
- AET model RX Rapid Thermal Annealer
- Custom Made Strip Annealer
- Wafer Fusion Annealer

## **Neuroscience Research Institute**

http://www.nri.ucsb.edu/index.html

### **Microscopy Facility**

Contact: Brian Matsumoto (matsumot@lifesci.ucsb.edu)

#### Instruments:

**Basic Light Microscopy** 

- Two upright microscopes equipped for high-resolution fluorescence and digital recording of the images (Olympus BX 51, BX60 with MacroFire camera).
- One upright microscope equipped with oil immersion darkfield darkfield condenser and low light digital imaging camera (BX 51 with Qimaging camera).
- One Stereo microscope with photoports for imaging specimens in three-dimensions (Olympus SZXZ with MicroFire camera).





One inverted microscope equipped with long working distance phase objectives and epifluorescent illuminator. This microscope is used for looking at cultured samples Petri dishes or multi-well plates.

Confocal Microscopy

There are two confocal microscopes, a point-scanning laser based system for the highest vertical and lateral resolution (Olympus Fluoview 500) and a spinning disc confocal microscope (Olympus DSU) for live cell recordings.

Electron Microscopy

- The facility has a JEOL 123 transmission electron microscope for imaging specimens that require resolving structures that are separated by only a nanometer.
- SOLiD DNA Sequencer

## **Physics**

http://www.physics.ucsb.edu/

### **UCSB Physics Machine Shop**

http://www.physics.ucsb.edu/etcetera/shops/machineshop/index.html Contact: Jeffrey Dutter (jdutter@physics.ucsb.edu)

Instruments:

Manual Machinery

- Manual Mills
- Manual Lathes
- □ Shear
- Press Brake

CNC Technology

- □ 4 four-axis CNC mills with xyz travel of 50"x26"x25"
- CNC lathe with swing capability of 20"

Welding/Metal Joining

- □ Spot welders
- □ TİG
- Plasma Cutting
- oxyacetylene for brazing
- □ hard and soft soldering





# AFFILIATES PROGRAM

## Psychology

http://www.psych.ucsb.edu/

### **Brain Imaging Center**

http://www.bic.ucsb.edu/ Facility Director: Dr. Scott Grafton (grafton@psych.ucsb.edu)

Instruments:

- Magnetic Resonance Imaging system with a large-bore 3-tesla (3T) magnet and associated echo-planar functional imaging hardware and software
- □ Functional MRI (fMRI)