

Objective:

The Surface and Thin-Film Analysis Laboratory provides surface analysis and develops working relationships with academic and industrial researchers at the University of Buffalo and throughout Western New York. The staff maintains support for customers at varying levels of involvement. Qualified personnel can be trained to use instrumentation for work on long term projects or the facility staff will perform sample and data analysis.

Capabilities:

The Cluster is very well equipped with ultra high vacuum instrumentation ranging from X-ray Photoelectron Spectroscopy (XPS) with heatable /coolable sample handling, reaction diameter and Low Energy Ion Scattering capabilities, to state-of-the-art Imaging Time of Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) with heatable/coolable sample probe and 2 micron lateral spatial resolution. Additional instrumentation includes a quadrupole SIMS with rapid sample introduction and a FTIR spectrometer with reflection/absorption and ATR attachments.

Computing Capabilities:

Network: PC/SUN based workgroup running Win95 and X-Windows with writeable CD-ROM

Instrumentation:

1. Leybold-Heraeus LHS 10 SIMS 100 Quadrupole Secondary Ion Mass Spectrometer
2. Physical Electronics Model 7200 Imaging Time-of-Flight Secondary Ion Mass Spectrometer
3. Physical Electronics Model 5300 X-Ray Photoelectron Spectrometer
4. Nicolet Magna 550 Fourier Transform Infrared Spectrometer

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Surface and Thin-Film Analysis Laboratory of the Materials Research Instrument Facility (MRIF)

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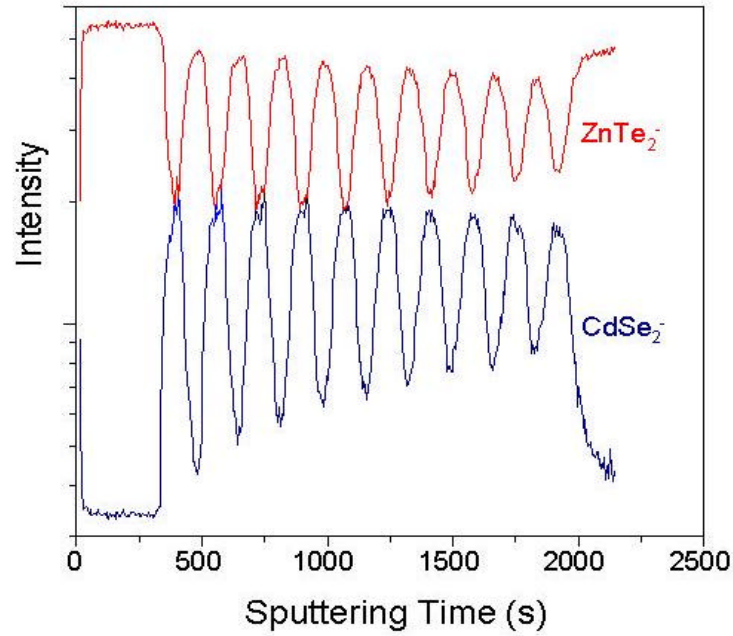
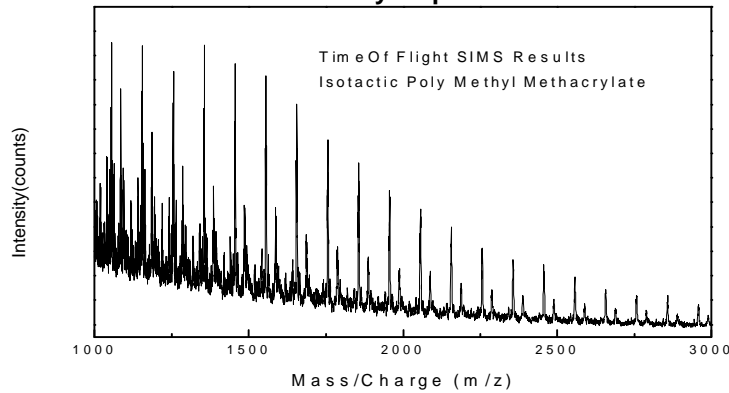


Time of Flight Secondary Ion Mass Spectrometer

Physical Electronics model 7200 ToF-SIMS uses a primary ion beam generated with a Cesium Liquid Metal ion gun. The ion gun is capable of producing an 8 KeV beam that can be pulsed at under

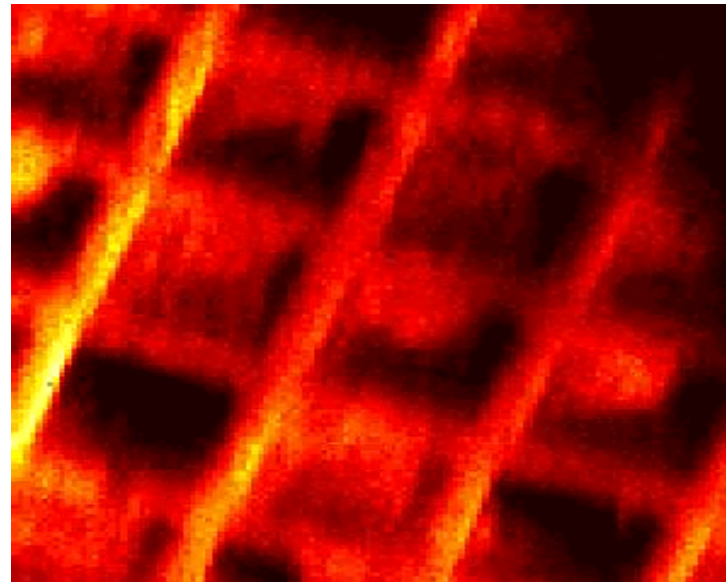
one nanosecond and focused to 2 μm . Secondary ion fragments are mass separated with a reflectron type time-of-flight tube. The instrument is used to take surface mass spectra with an analysis depth of approximately 1 nm. Negative and positive ions can be analyzed. Survey, chemical imaging and depth profiling modes are available with a usable mass range to 10,000 m/z. A mass resolution of 11,000 M/ Δ M at 29m/z is attainable for selected samples. Mass spectral data analysis is performed on a Sun Sparc 10 work station. A heatable (+200°C) and coolable (-200°C) sample probe provides a full range of analysis temperatures. The ToF-SIMS can provide the user with basic mass spectral data which can be interpreted for chemical information about constituents in the ppm or ppb range. Surface concentration can be calculated for some samples with sufficient preliminary studies. The ion gun can be used to sputter samples for depth information. Chemical mapping can be used to analyze areas of 100 μm to 200 μm for both atomic and molecular ions.

Survey Spectrum



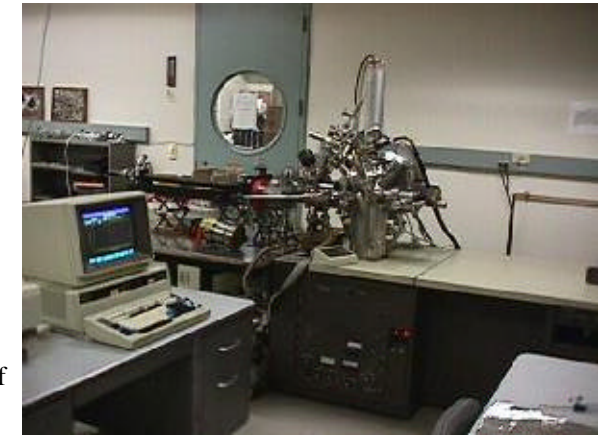
Depth Profile of ZnTe_2^- and CdSe_2^- of MQW structures.

ToF-SIMS Total Ion Image: TEM grid coated with polymer 200um X 200um



X-ray Photoelectron Spectrometer

For XPS measurements X-rays are generated with Mg and Ti targets. Ejected electrons are analyzed with a hemispherical analyzer capable of a resolution of 0.1 eV. Samples can



be analyzed over a range of angles (relative to the analyzer) from 10° to 90° to provide varying degrees of surface sensitivity. Analysis depth of 1 nm to 20 nm are possible, but are sample dependant. A heatable (+200°C) and coolable (-200°C) sample probe provides a full range of analysis temperatures. This temperature probe has been recently updated to provide a full range of analysis angles. Depth profiling is accomplished with a He, Ar, or Ne gas ion gun. Data analysis is performed on a Physical Electronics Profession Computer. The XPS can provide the user with basic atomic surface concentrations, chemical information from peaks shifts due to chemical environment, and depth information by angle dependent experiments or ion gun sputter depth profile.

X-Ray Photoelectron Spectroscopy

