ENERGY CONVERSION DEVICES, INC.
CENTRAL ANALYTICAL LABORATORY

The laboratory has been in operation since 1960 as an in-house technical and analytical support facility for Energy Conversion Devices / Uni-Solar and its subsidiaries. We are conveniently located in southeastern Michigan to service your analytical needs. We specialize in phase and micro analyses. Our laboratory personnel have a wide range of expertise based on their experience in research, failure analysis, and quality control.

SCANNING ELECTRON MICROSCOPY (SEM) for high resolution, high magnification photographs. Elemental analysis with EDS and WDS attachments.

JEOL JSM6320F & **JSM-35C** research-grade scanning electron microscopes.

- Imaging from 10x to 400,000x
- Secondary and backscattered electron detectors for topographic and compositional contrast imaging.
- Samples up to 3-inch diameter.
- Digital images electronically archived.

ENERGY DISPERSIVE X-RAY SPECTROMETRY (EDS) for quick and easy elemental analysis of samples in the scanning electron microscopes.

Kevex Sigma 32 on both scanning electron microscopes.

- One micrometer spot analysis
- Digital line scan and X-ray image mapping
- Simultaneous detection of all elements from B to U
- Minimum detection limit of 0.25 wt%
- Fully quantitative results by extended φ-ρ-z.

WAVELENGTH DISPERSIVE X-RAY SPECTROMETRY (WDS) for a more detailed elemental analysis of samples in the scanning electron microscope.

JEOL Four-Crystal Spectrometer attached to the JSM-35C scanning electron microscope.

- One micrometer spot analysis
- Digital line scan and X-ray image mapping
- Elemental detection from Be to U
- Minimum detection limit of 0.01 wt%
- Fully quantitative results by extended φ-ρ-z.

INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY (ICP-AES) trace level and bulk elemental analyses of solids and liquids. Varian Analytical Instruments Liberty 100 air pass inductively coupled plasma atomic emission sequential spectrometer.

- Minimum detection limits better than 1 ppb by weight (element/line dependent)
- Bulk solid acid digestion (for powders, residue, ingots, etc.) and liquid analyses
- Analysis of all elements from Li to U (excluding N, O, F, S, and noble gases)
- 0.75 meter Czerny Turner monochromator with holographic grating allows high--intensity spectra up to four peak orders with 0.006nm resolution through a wavelength range of 189-900nm

X-RAY DIFFRACTION (XRD) for compound / phase analysis (qualitative and quantitative), crystallography, residual stress, texture, and Glancing Incidence on powders, bulk, and thin films. Panalytical X'Pert PRO, and Philips Dual Diffractometer systems with automated digital control.

- Independent Ω/2θ, sample spinners, 21 and 45 sample changers allowing 24/7 operation for extended multisample throughput.
- Crystallography and Rietveld modeling of samples from bulk to the atomic or unit cell scale
- Advanced digital software data handling capabilities
- Average crystallite size, lattice dimensions and microstrain determination
- All optically encoded, high resolution, decoupled Omega-2θ goniometers
- Cu K alpha standard radiation source.
- Quantitative phase / compound analysis of samples; flat, irregular, thin films, powder, atmospherically sensitive, etc.
- Residual stress
- GIXRD (Glancing Incidence) on thin films and substrates, provides surface layer analysis.
- Small spot capabilities (100 micron limit).
- Texture analysis provides orientation of crystallites.

FOURIER TRANSFORM INFRARED SPECTROSCOPY (FT-IR) is useful for identifying organic and inorganic compounds
Perkin Elmer SYSTEM 2000.

- Near, Mid, Far IR: 15,000 - 30cm^{-1}
- Specutar and Diffuse Reflectance
- Attenuated Total Reflectance (ATR)
- Microscope (> 10μm spot, 10,000 - 580cm^{-1})
- Transmittance and Reflectance.

SAMPLES:

- Thin films (T and V-ATR)
- Powders/Bulk (DR, SR KK)
- Liquids (Neutral pH) (H-ATR)

METALLOGRAPHY
with a full range of optical microscopes / mounting / etching.

- Cold and hot sample mounting
- **Leco AP-200** automated polishing system
- Wet lab for chemical etching
- **Reichert-Jung MeF3** metallograph
  - 20x to 2000x
  - Bright field and dark field
- Differential interference constant imaging
- **Zeiss Standard-14** upright microscope
- **Zeiss SV-8** stereomicroscope 8 to 64x

Digital images available.

Use our instrumentation and expertise to solve your development, production and quality control problems.

INSTRUMENTATION:

- Scanning Electron Microscopy - JEOL JSM-35C and JSM6320F
- Electron Microprobe - Kevex EDS, JEOL WDS
- X-ray Diffraction - 3 Automated Digital Philips / Panalytical diffractometers
- Inductively Coupled Plasma - Varian Liberty 100
- Fourier Transform Infrared Spectroscopy - Perkin Elmer SYSTEM 2000
- Metallographic Inspection

Certification limited to analyses within the scope of our accreditation. Scope available upon request.

For further information or to discuss your analytical problem, please contact:
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PRICE INFORMATION:

- One week turnaround time is typical for routine work.
- 50% surcharge for guaranteed 24-hour turnaround.
- Contract rates available for long term requirements or large numbers of samples.
- Prices are effective May 23 2008 and are subject to change without notice.

Scanning Electron Microscopy (SEM)
$200/hr.

Energy Dispersive X-ray Spectrometry (EDS)
$200/hr.

Wavelength Dispersive X-ray Spectrometry (WDS)
$200/hr.

X-ray Diffraction (XRD)
Quoted on request
Price break multiple samples

Inductively Coupled Plasma (ICP)
$25 Prep/Sample + $25ea/Element
Minimum $100

Fourier Transform Infrared Spectroscopy (FT-IR)
Routine analysis for thin films, liquids:
$200/hr.
Powder samples, microscope, special sample preparation or analysis:
Quoted on request.

Metallographic Preparation
Basic prep includes cutting, mounting, and polishing.
$100/each

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