

## SPECIFICATIONS

### Modification of NRL X-ray Photoelectron Spectrometer

We are seeking to modify an existing X-ray Photoelectron Spectrometer (XPS), an ESCALAB 220iXL manufactured by Thermo VG Scientific (located in Bldg. 207, Room 361), by replacing both the monochromated and non-monochromated X-ray sources and data system. The new X-ray sources and data system must therefore be compatible and readily integrated with the existing ESCALAB 220iXL spectrometer. The following minimum instrument specifications are required including installation:

#### Monochromated X-ray Source

- Micro-focused aluminum anode X-ray source with computer controlled and selectable spot sizes in the range of 150  $\mu\text{m}$  to 600  $\mu\text{m}$
- Twin crystal X-ray monochromator
- Computer-controlled digital power supply with voltage range of 0 to 15 kV
- Safety interlock system to prevent shock from high voltage and equipment damage from loss of water coolant flow and/or vacuum

#### Dual Anode X-ray Source

- Water cooled and electronically selectable magnesium and aluminum dual anodes
- Computer-controlled digital power supply with voltage range of 0 to 15 kV
- X-ray power of at least 600 Watts for the aluminum anode and 400 Watts for the magnesium anode
- Safety interlock system to prevent shock from high voltage and equipment damage from loss of water coolant flow and/or vacuum

#### XPS Data Acquisition and Processing System

- Computer with the following minimum features
  - Pentium III processor
  - 850 MHz
  - 18 inch LCD monitor
  - Windows NT operating system
  - Control & data acquisition interface cards for ESCALAB 220iXL
  - Video card for XPS imaging & video capture
  - Cables and connectors
- Control & data acquisition software for ESCALAB 220iXL including
  - Spectrometer
  - Ion gun
  - Specimen microscope image
  - X-ray sources
  - XPS imaging
  - Specimen manipulation

- Data & spectrum processing software for ESCALAB 220iXL including
  - XPS spectrum analysis (add/find peaks, identify peaks, quantify peaks)
  - XPS spectrum modification tools (smoothing, background subtraction, differentiation/integration, charge shift correction)
  - Automated peak fitting routines
  - Sample profiling routines
  - Spectrum comparison and overlay routines
  - Numerical methods (non-linear & linear least squares fit, target factor analysis)
  
- Image display & processing software for ESCALAB 220iXL
  - Image display (grey & color scale, change contrast/brightness, overlay 2 images, histogram)
  - Imaging processing (smoothing, edge detection, high/low pass filters, erode/dilate/gradient, arithmetic—add/subtract/multiple/divide—image operations)
  - Scatter graphs
  - Data import & export

#### **Specimen Manipulation Stage and Control System**

- Computer-controlled (via the XPS data acquisition & processing system described above), motorized high-precision specimen manipulation stage with
  - 5-axis (X,Y,Z, azimuthal rotation & tilt) motion control
  - Travel of at least 50 mm in X, 20 mm in Y & 12 in Z with minimum resolution of 5  $\mu$ m
  - Rotation programmable to a fixed position or continuous with variable speeds up to 60 rpm
  - Tilt of  $-90^{\circ}$  to  $+60^{\circ}$  from horizontal
  - Cables and connectors