XPS2 Ion Scattering Spectroscopy (ISS) Operating Procedure

Ion Scattering Spectroscopy (ISS) is a technique for detecting elements which are present in the top monolayer of a surface, making it even more surface sensitive than XPS. It works by firing a beam of noble gas ions (typically 1keV He+) at the surface and measuring the kinetic energy of the ions scattered from that surface. Peaks are observed in an ISS spectrum corresponding to elastic scattering of ions from atoms in the top monolayer of the sample surface. Each element at the sample surface produces a peak at a different measured kinetic energy, caused by the momentum transfer between the incident ion and atom.

Help Resources

XPS knowledge viewer – Complementary Techniques – ISS (Ion Scattering Spectroscopy)

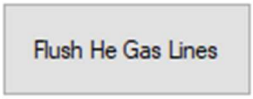
Nexsa G2 User Manual (page 90) provided by Thermo Scientific is located in the Manuals folder on the desktop

Important Notes

- ISS uses the ISS Gun as the Helium Ion source, and the beam size is about 700-800nm in diameter
- For ISS processing, the ISS spectra must be acquired in tandem with an XPS survey spectrum. The XPS survey spectrum will inform the ISS peak identification.

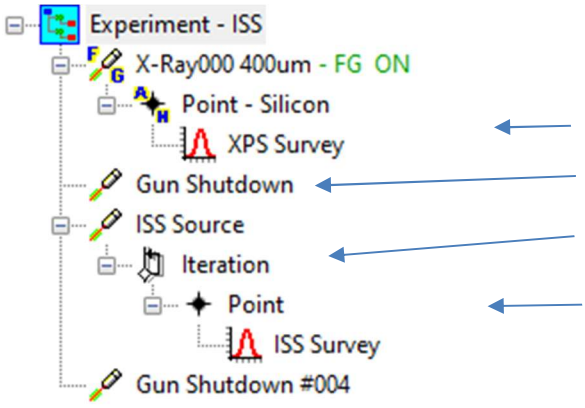
Procedure

1. Flush He lines (takes 10 min)
    1. Vacuum details
    2. Vacuum Detailed Tab
    3. Click “Flush He Gas Lines”



2. Check to see if UV source will turn on
    1. Open UV source menu from bottom task bar and click “Turn On”
    2. If UV source does not come on after a few minutes, repeat steps 1 and 2. Note - it may take several attempts if the UV source hasn’t been used in a while
    3. Turn off UV source

An example ISS experiment is shown below



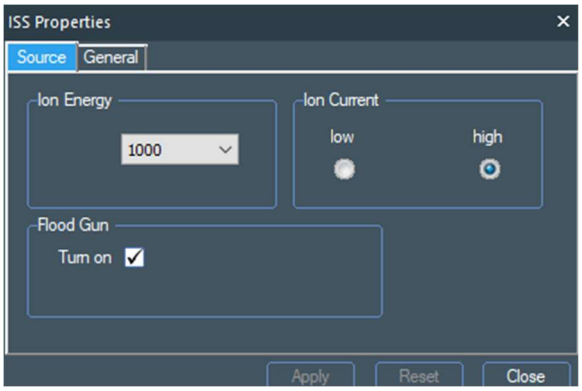
Use the X-Ray source to perform Auto-Height and collect an XPS survey scan. Make sure "Enable Auto-Height" is selected in the Point Object.

Shut down the X-Ray gun

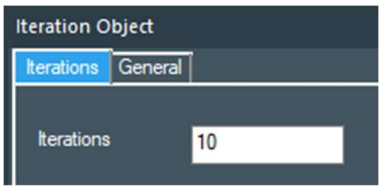
Iterations can be added to do a very slow depth profiling using the He+ ions

Deselect "Defined Point" and disable Auto-Height to use the point defined by the XPS position above

1. Set up an XPS run to perform Auto-Height and collect an XPS survey scan. Make sure "Enable Auto-Height" is selected in the Point Object
2. Insert a Gun Shutdown step to turn off the X-Ray gun
3. Insert ISS source with the following parameters:



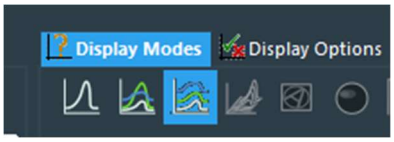
4. If desired, add iterations to perform a very gentle and slow depth profiling using the He+ ions of the ISS source. The iteration command is found under the miscellaneous (gear) ion header

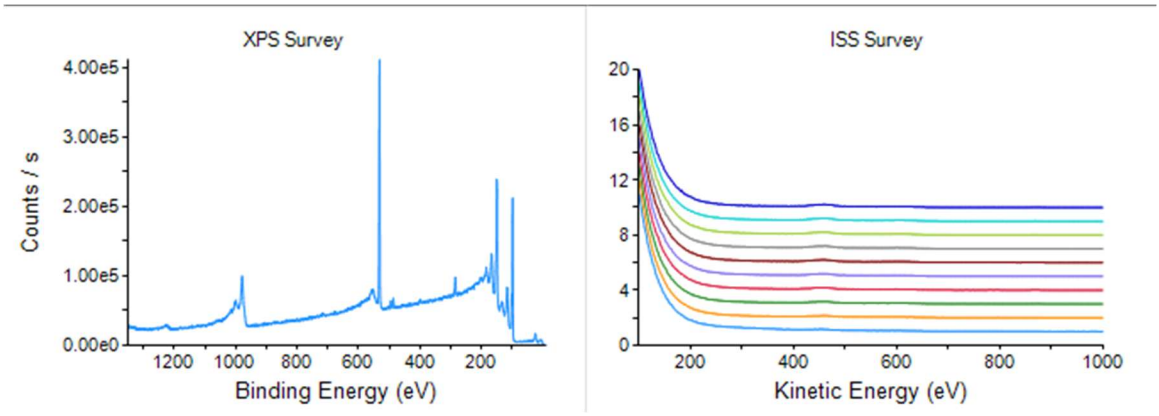


5. Insert an ISS survey from the Multi-Spectrum menu
6. Insert a Gun Shutdown step
7. Start experiment by clicking on the green arrow

Viewing Data

1. View and process the data by dragging the point position in the experiment tree to the large window on the right
2. If more than one iteration was performed, a stacked view of all iterations in the ISS survey can be viewed by selecting “Stacked Chart Mode” under Display Modes





Processing Data

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See “Processing ISS data (video) in the XPS knowledge viewer

1. Select the ISS spectrum and change to “Single Trace Mode” if Stacked Chart Mode is currently displayed.

2. Select both the XPS survey and the ISS survey spectra and open the ISS Survey tool

3. This will automatically identify the peaks in the XPS survey and label the relevant corresponding peaks in the ISS survey