

Nanoscale Analysis with STEM

Analytical STEM-in-SEM

SMART - POWERFUL - FLEXIBLE

STEM-in-SEM (Scanning Transmission Electron Microscopy in an SEM) has become a popular technique for biologists, polymer scientists and materials scientists for its ease of use, cost effectiveness and high resolution. It is especially suited to investigation of the internal structure of thin film (50-100nm) samples as well as size and shape of submicron to nanometer particles. With standard SEM imaging modes and EDS analysis on bulk samples, there are limitations in the ultimate resolution that can be achieved due in part to the beam-sample interactions. With STEM-in-SEM, the sample is very thin and the interaction volume is greatly reduced, which allows for sub-nanometer resolution and nanoscale analysis. One of the main challenges to EDS analysis using STEM-in-SEM is how to reduce the hard X-ray contribution from the detector and chamber (generally peaks from Al and Si). JEOL has designed a dedicated Analytical holder with a carbon retainer that greatly reduces these spurious peaks allowing for more accurate analytical data.

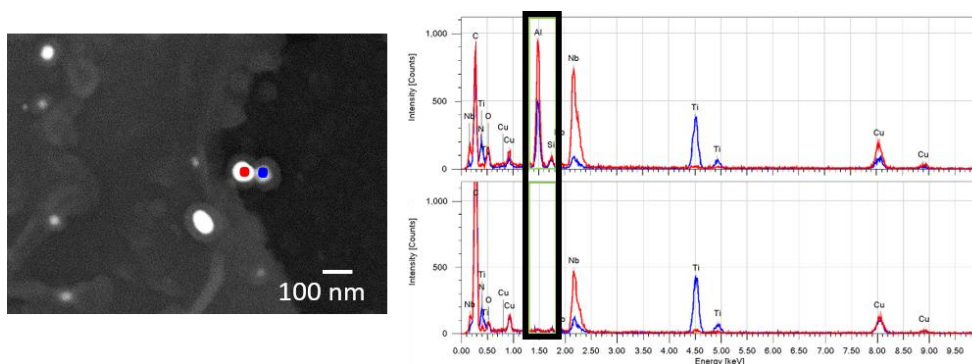


Figure 1: Mixed nanoscale precipitates. Top spectra, using standard STEM holder, shows spurious Al/Si peaks. Bottom spectra, using Analytical STEM holder, shows significantly reduced peaks.

Fig. 1 shows two close nanoscale precipitates with distinct spectra. A standard STEM holder is used for the top spectra, where Al and Si peaks are observed. The dedicated Analytical holder is used for the bottom spectra and the Al and Si peaks are significantly reduced.

Identifying Al or Si in a STEM sample is generally very difficult because of these spurious peaks. Now, with JEOL's Analytical holder, this identification is simple. Fig. 2 shows three different precipitates, one which contains Al. The spectra of the other two precipitates show no discernable Al peak, which gives confidence in the analysis.

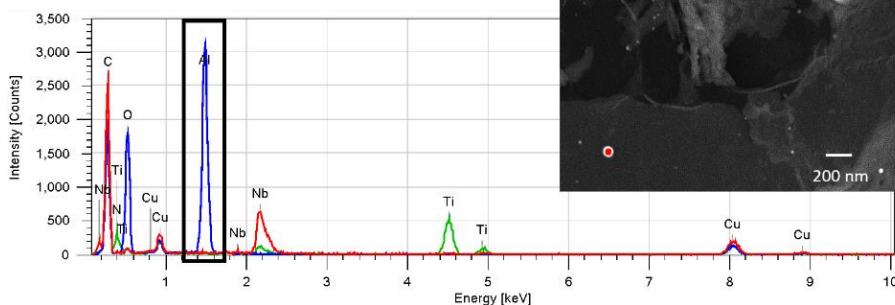


Figure 2: Aluminum can be identified within the sample (blue spectra) using the Analytical holder, as there are no spurious Al/Si peaks detected in the other two precipitates (red and green spectra).