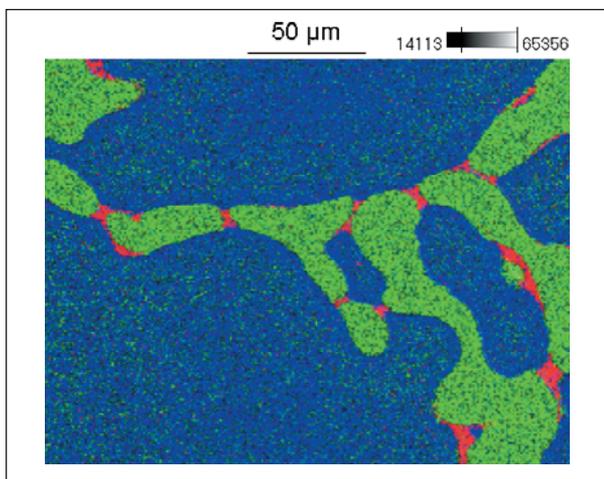


Identify unique components in Spectral Imaging data with advanced statistical analysis software. COMPASS software removes user assumptions from the process, delivering uniquely identified phase maps and spectra in minutes.

COMPASS Component Analysis Option

NORAN System 7 Software



Composite image of components automatically identified by COMPASS

By collecting a complete, deadtime-corrected spectrum at every point in a sample, Spectral Imaging on the Thermo Scientific NORAN System 7 X-ray microanalysis system provides a wealth of elemental data. A number of traditional tools can extract meaningful information from Spectral Imaging data. However, attempts to characterize unknowns can produce erroneous results if unexpected elements are missed due to overlapping peaks or insufficient intensities above a high background signal prevent mapping – or wherever assumptions about the sample lead to misinterpretation.

This option eliminates the pitfalls of traditional analytical techniques by running a comprehensive, unbiased statistical analysis on every energy channel in the Spectral Imaging data set. COMPASS software presents its findings in the form of an image and spectrum pair for each distinct component that it finds.

The COMPASS option provides an excellent means of identifying minor components in the sample (so-called needle in the haystack components), locating unique components where peak overlaps “hide” important regions, and in finding significant features down to the single pixel, even in very noisy data.

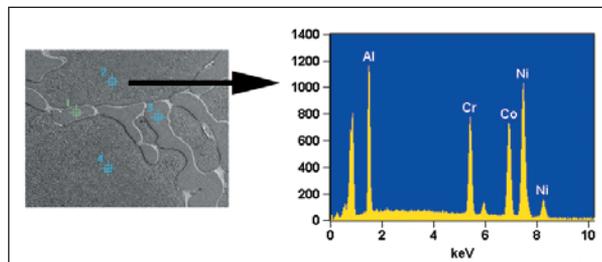
COMPASS software was developed at Sandia National Laboratories and is licensed to Thermo Fisher Scientific.

Benefits

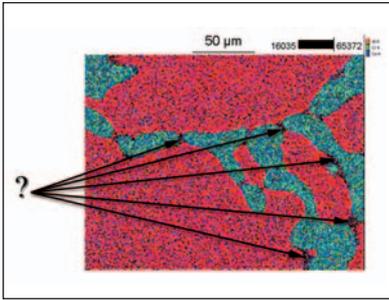
- One click operation – no set-up parameters or user input required
- Eliminates elemental selection for X-ray mapping, and “missed” data due to user assumptions, peak overlaps or low intensities
- Apply powerful multivariate statistical analysis to Spectral Imaging data
- All energy channels analyzed and compared against all spectra in the data
- Unambiguously identifies major and minor components in the sample
- Finds chemically distinct regions as small as one pixel in very noisy data

Multi-element Component Identification

COMPASS is extremely useful in quickly locating spectral finger prints in the sample where traditional X-ray microanalysis methods would either require point-by-point examination of the data, or require possibly misleading assumptions made prior to the analysis, as shown in the following examples. Multi-point analysis of a turbine sample yields spectra and element identification. However, decisions must be made regarding



Multi-point spectral extraction



Composite X-ray map of identified elements, showing missed information

what points to sample. Or, every point in the sample must be examined, a prohibitively time-consuming process with very low intensities per point.

X-ray mapping requires that important elements be identified prior to the analysis. This selection requires some foreknowledge of the sample's composition. If elements are missed, "black holes" may be introduced to the analysis.

COMPASS software finds image locations that have the same spectral fingerprint, with no assumptions about the chemical composition of the sample. Elemental phase maps show the spatial distribution of regions that have statistically similar spectral features (peak locations and relative peak heights) and cumulative spectra of these regions. Quantitative analysis of each elemental phase is now possible.

Point Analysis Limitations

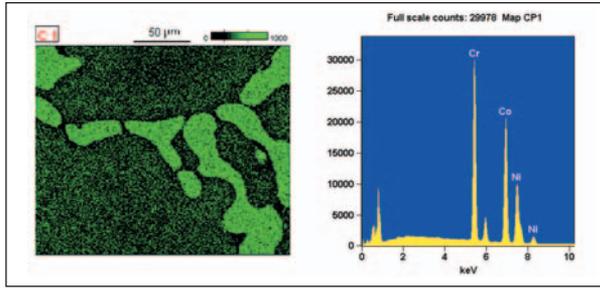
- Decisions must be made regarding points to analyze
- Imported features easily missed
- A 512 x 512 point image yields 262,144 spectra
- Individual spectra have low intensities

X-ray Mapping Limitations

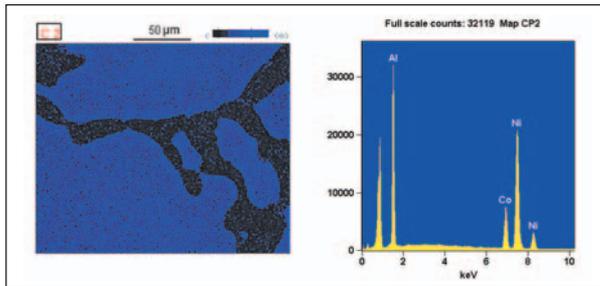
- Generally not quantitative
- Susceptible to artifacts
- Relies on foreknowledge of the elements to map
- Cannot discern elemental correlations (e.g., Al versus Al₂O₃)

COMPASS Option Advantages

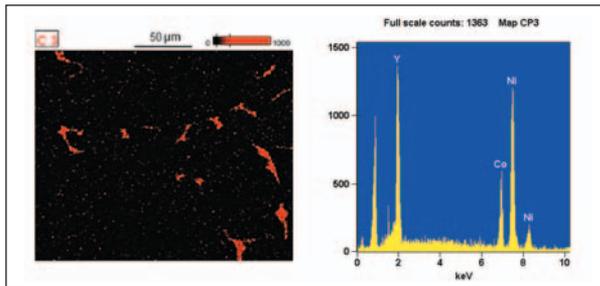
- Elemental phase distribution
- Elemental correlations identified by phase
- Spatial deconvolution
- Spectral deconvolution
- Single pixel sensitivity
- User bias and possible error is eliminated



Cr-Co-Ni Elemental Phase



Al-Co-Ni Elemental Phase



Y-Co-Ni Elemental Phase