Spectrum Match is a powerful software program which enables a search through a custom-built spectrum library for automatic identification and match of a spectrum to similar spectra. The identification of an unknown is greatly simplified when it is compared to a group of potential candidates and this reduces the complexity of finding discrepancies and similarities between spectra.

The process of matching an unknown spectrum to the potential library candidates is based on the Chi-squared goodness of fit statistical approach comparing either concentrations or spectra lines directly. The match sensitivity is adjustable, providing full control over match results for the desired degree of confidence.

The potential matching spectra are overlaid on the original spectrum with the match percentage giving a measure of how similar or dissimilar the spectra are together with a visual representation of the differences.

The EDAX Smart Materials and Minerals Library option provides 150 entries of common metal standard alloys and minerals. The 90 steel spectra, which are included consist of:

- Stainless steels
- Alloy steels, Ni-based and Cu-based alloys
- Tool steels
- Carbon steels

In addition, the library contains more than 50 silicates and other geological standard materials for use in the identification of environmental and mineralogical components.

Using the library, the top three matches for the unknown sample are displayed with numerical values of goodness of fit % along a spectral overlay confirming the details of spectral peaks fit.
Smart Materials and Minerals Library

- 90 steel spectra
  - Stainless steels
  - Alloy steels, Ni-based, Cu-based alloys
  - Tool steels
  - Carbon steels

- 50+ silicates and other geological standard materials

- Two methods of Spectrum Match
  - Chi-Square on Spectrum
    - Good when there are other artifacts or unknowns
    - No need for peak ID
  - Chi-Square on Concentration
    - Good when using different conditions such as kV

- Users can build their own custom library and share between multiple systems or sites

- Advanced search for building libraries based on spectral conditions, elemental ranges or date

Spectrum extracted from map visibly and numerically identifies this phase as SbS with a much higher fit % compared to CaSO₄ even though they contain common elements and despite the challenging Sb and Ca peaks.

S map (left) and phase map (right), which shows this distribution of the S that is present in multiple phases, including SbS and CaSO₄.

Spectrum Match is the fastest way to achieve conclusive material characterization solutions even with peak overlaps causing interference, as the quantification numbers are less sensitive to changes in acceleration voltage, geometry, and detector characteristics.

Conclusion

Spectrum Match is a versatile tool that finds a multitude of applications. These include failure analysis and quality control, where defects can be compared to a library of potential contaminants, process control, where changes in distribution and composition can quickly be identified with the combination of phase mapping and spectrum matching, or reverse engineering, where material constituents can be matched against a library of standard components found in the material.