

Algorithm

A typical algorithm for background subtraction might be

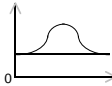
- 1. determine the range
- 2. determine the shape
- 3. determine the endpoint values
- 4. apply the background
- 5. consider whether your choices where suitable

Background subtraction can be an iterative process.

MTS 723 9

Constant

A constant background removes a constant value from the spectrum in the selected range.



Application Note

This can be used in all cases.

pros

all spectra typically have a constant underlying offset in the signal throughout their range
easy to apply

cons

not always the end of the story (further background subtraction is typically needed)

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Linear

A linear background removes a sloped line from the spectrum in the selected range.

Application Note

This is very often the best "first guess" for the background shape.



pros

easy to apply

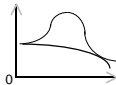
cons

not always rigorous (theoretically sound)
requires careful selection of range and endpoint behavior
can alter the shape of spectral features

MTS 723 11

Higher Order Polynomial

A polynomial background removes a curved line from the spectrum in the selected range.



pros not really

cons

generally never rigorous (theoretically sound)

Application Note

You better know what you are doing with this and why!

requires extreme care in selecting range and endpoint behavior

requires extreme care in selecting the order of the polynomial and the fitting method

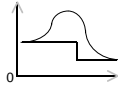
will alter the shape of spectral features

MTS 723 12

Step

A step background removes a constant step from the spectrum in the selected range.

Application Note
This is used to fit the Fermi edge in valence band spectra.



pros
easy to apply

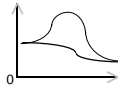
cons
will change peak parameters

MTS 723 13

Cosine

This removes a cosine shaped curve from the spectrum in the selected range.

Application Note
This is used to fit spectra from synchrotron radiation sources.



pros
relatively easy to apply

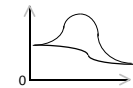
cons
will change peak parameters

MTS 723 14

Shirley (Integrated)

This removes an integrated shape curve from the spectrum in the selected range.

Application Note
This is used with XPS spectra.



pros
some basis in theory

The height of the background is proportional to the area under the spectrum up to that channel.

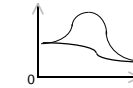
cons
requires numerical integration of spectrum
will change peak parameters

MTS 723 15

XPS Analytical

This removes a curve that has an analytical form.

Application Note
This is used with XPS spectra.



pros
basis in theory

The height of the background is calculated by a recursive formulation based on the remaining area up to the channel and the value at the channel.

cons
requires numerical integration of spectrum
requires a recursive, iterative fitting algorithm
will change peak parameters

MTS 723 16

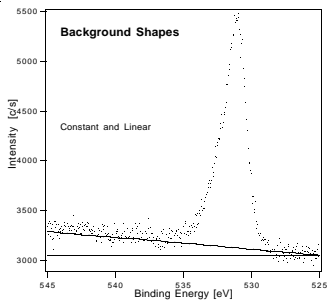
Problems

Background subtraction will change peak parameters.

- peak position
 - will shift in all cases but the constant background
- peak half-width
 - will cause or remove asymmetric shape of peak
- peak height/area
 - will depend on the type of background removed

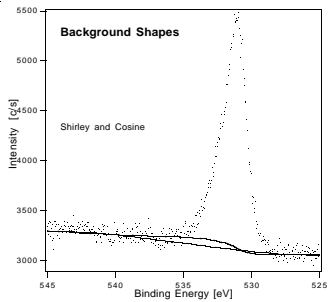
MTS 723 17

Constant and Linear



MTS 723 18

Shirley and Cosine



MTS 723 19