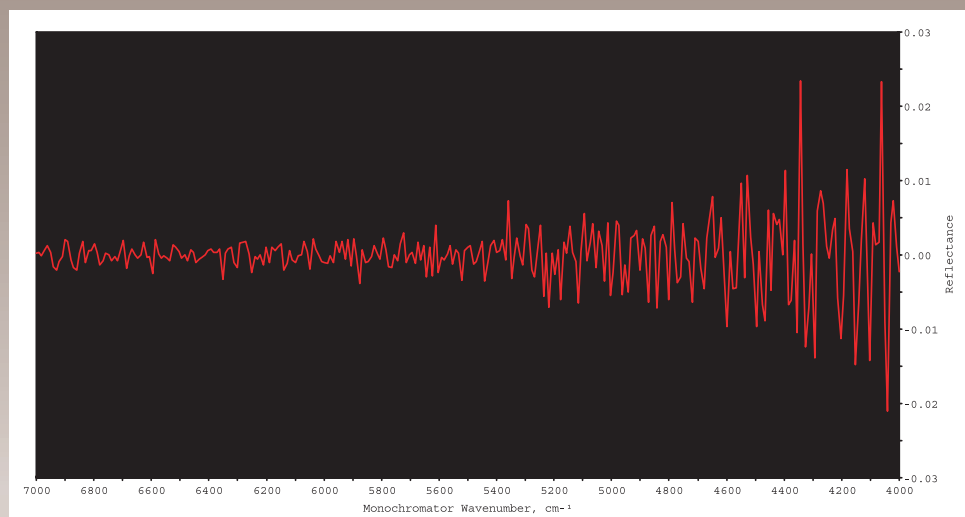


Digital Filtering for Best Noise Removal

Noise removed following a 25 point digital filter



Modern Noise Reduction is Perfect, Verifiable & Reversible

Traditional noise reduction is done by slow scanning, averaging of multiple scans, or other time-consuming techniques which are not free from systematic error.¹

Because scanning slowly, applying a time constant, or other pre-data acquisition decisions affect the data before they are collected,

With the traditional method,

- There are no raw data to return to, so there is no means of adjusting the data once they are acquired.
- There is no means of determining whether the spectrum has been distorted
- There is no means of post-collection noise reduction without collecting other spectra and averaging them.

Digital filtering is a mathematical removal of all random information obscuring the spectral shape.

In the case of Olis data acquisition, the software directly acquires up to 1,000,000 data points per second. This method approaches the ideal: a fully digital acquisition of raw signals to determine the answer. Benefits of this method are,

Whereas, the Olis Digital Subtractive Method

- Allows maximum data acquisition rates under all conditions
- Allows reversible noise filtering after raw data are collected

¹ "A simple general procedure for calculating the convolution weights at all positions, for all polynomial orders, all filter lengths, and any derivation is presented. The method, based on the recursive properties of Gram polynomials, enables the convolution technique to be extended to cover all points in the spectrum." Anal Chem, 1990, 62, 570-573.

Single CoSO_4 Spectrum Collected in Seven Minutes

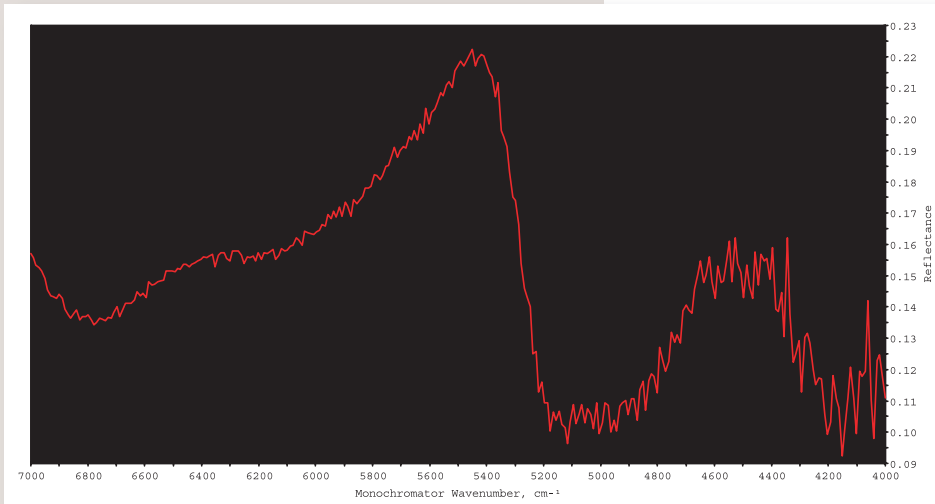


Figure 2: Raw data acquired from an Olis NIR Reflectance Spectrophotometer

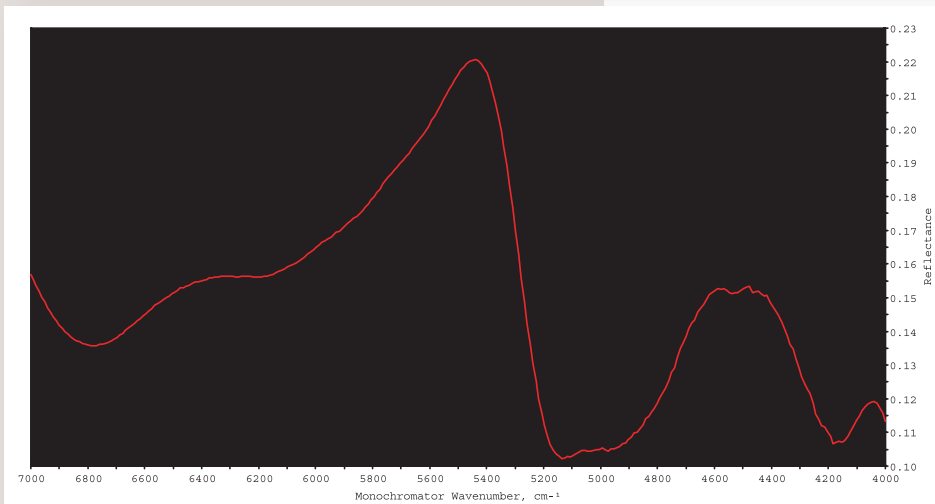


Figure 3: Spectrum shown in figure 2 after application of a 25 point digital filter

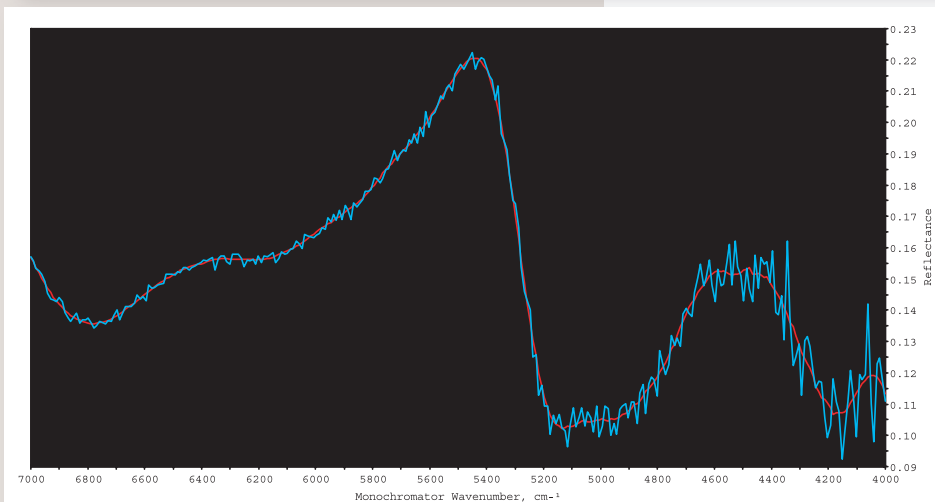


Figure 4: Raw and filtered data overlaid.

Their difference is shown on the front cover, verifying the perfection of the filter selected: no structural information was lost (or added) and noise reduction is equally good for high and low noise levels. Had the noise been structured, the investigator would know to use a larger or smaller filter.

Single CD Spectrum Collected in 8.37 Minutes

Figure 5: One CD spectrum collected in under 8.5 minutes, with no time constant setting or other pre-presentation processing done.

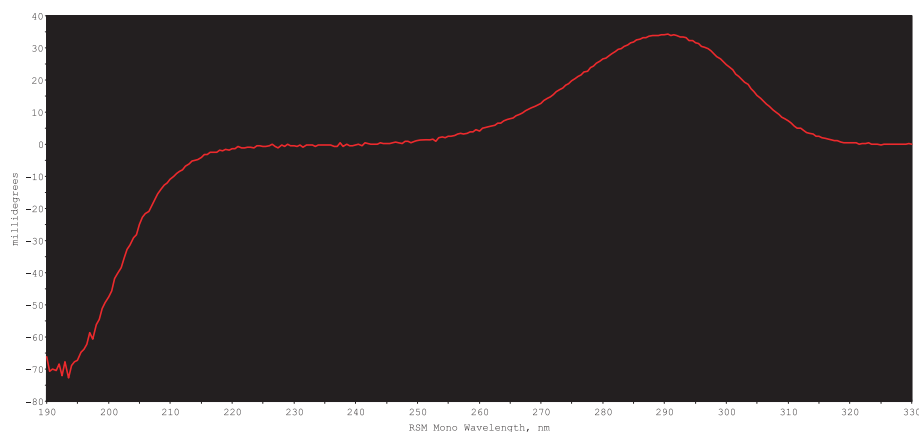


Figure 6: Spectrum from figure 5 after 13 point digital filter application

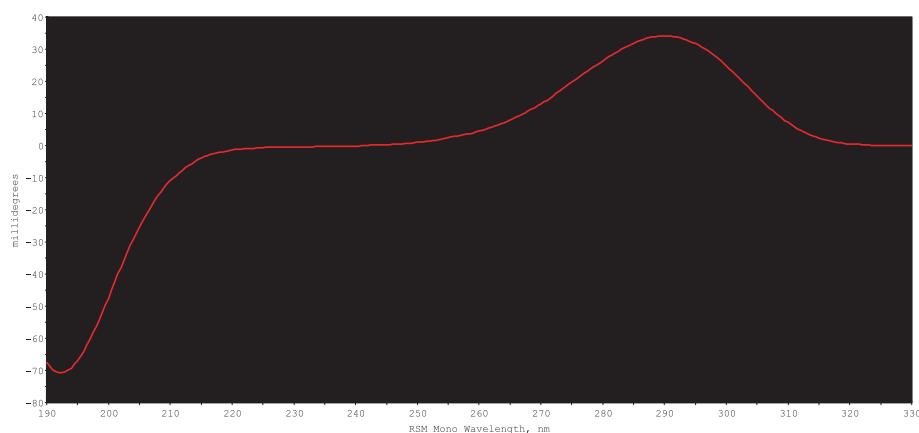
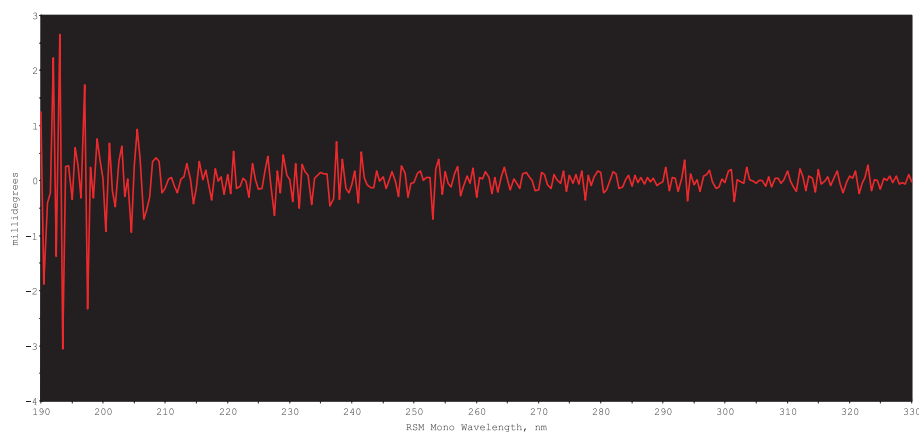


Figure 4: Difference between the raw and filtered spectra. Notice absolute symmetry of noise above and below zero and along the entire record, first point to last.



Every Olis spectrophotometer is designed for digital data acquisition and digital data processing.

The alternative is reliance on pre-collection hardware or software settings, which cannot be reversed, which often necessitate additional time or sample, and which can introduce systematic noise.

Benefits of Digital Filtering:

- Full noise removal is possible without repetitive scans and averaging
- The shape of the spectrum with the noise removed by the filtering can be confirmed as unaffected (not distorted).
- Useful information about the noise itself can be found in the difference between the raw unfiltered data and the final filtered data.



For more information on this and other Olis products:

- Visit www.olisweb.com
- Write sales@olisweb.com
- Call **1-800-852-3504** in the US & Canada
1-706-353-6547 worldwide
- Tour **On-Line Instrument Systems, Inc.**
130 Conway Drive, Suites A, B & C
Bogart, GA 30622