About PermaSure+ and the world's first Ph. Eur. 5.24 compliant FT-IR imaging

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What is chemical imaging?

Chemical imaging is an exceptionally effective tool to perform a very detailed and spatially resolved chemical analysis based on a sample's spectroscopic properties.

➔ If you're unfamiliar with chemical imaging please take a look at our short introduction to FT-IR imaging.

What is the intention of Ph. Eur. 5.24?

„It offers specific recommendations to assess the performance of chemical imaging systems for the qualitative and quantitative exploitation of images."
(Ph. Eur. Chapter 5.24; *1. Scope*)

➔ The value of chemical imaging is tremendous. For manufacturing, however, its use was limited due to missing guidelines. In 2016, the European Pharmacopoeia introduced the chapter 5.24 to address chemical imaging in its many forms, such as infrared, hyperspectral and raman imaging.

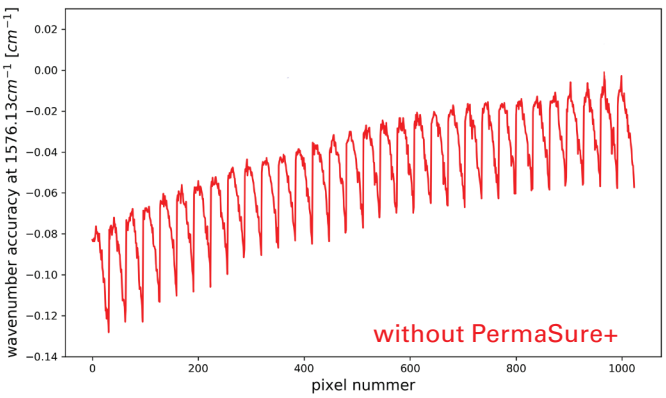

Figure 1: Variance of the position of the waterva-por band at 1576.13 cm^{-1} when measured without PermaSure+ calibration.

Why was compliance to Ph. Eur. 5.24 so hard to achieve?

„Optimal wavenumber accuracy is critical and should be achieved at the same level as for a standard spectrometer."
(Ph. Eur. 5.24; 3-2-2-1. *Spectral Axis*)

➔ This may sound trivial but is quite hard to do. In an FT-IR microscope the IR rays that reach different pixels on the array detector take slightly different ways within the interferometer. This must be considered when calculating the scale of the wavenumber axis. As a result, every pixel of the chemical image needs to have an individual calibration of the wavenumber axis. Figure 1 shows the wavenumber accuracy for an FT-IR microscope without Bruker's PermaSure+ calibration. The wavenumber accuracy strongly differs from pixel to pixel.

How did Bruker realize compliance to Ph. Eur. 5.24?

„Spectral axis calibration assigns wavelength and intensity values to every mapped pixel of the sample surface."
(Ph. Eur. 5.24; 3-2-2-1. *Spectral Axis*)

➔ PermaSure+ introduces a revolutionary pixel-by-pixel laser wavenumber calibration that takes the aforementioned problems into account. This brings the achievable x-axis accuracy to an unprecedented level on par with single-element detectors or, to be exact, "the same level" as standard spectrometers. Figure 2 elucidates the effect of PermaSure+ on the wavenumber accuracy of an FPA imaging detector. Through this calibration, each pixel now has a better and above all comparable wavenumber accuracy.

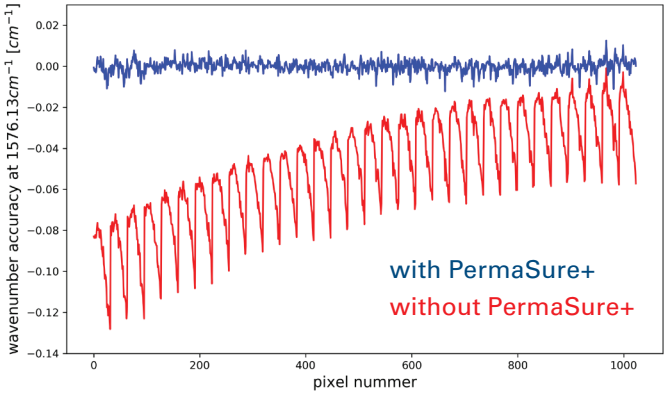

Figure 2: The same detector pixels as Figure 1 but with PermaSure+ enabled.

Better instrument - better results.

With the introduction of the LUMOS II Bruker is trying to make FT-IR imaging available to all applications and industries. By introducing new and exciting technologies, it is our goal to provide customers with the performance and usability they expect from a state-of-the-art scientific instrument. If you have further questions please contact your local sales representative or use our webform to submit your request.

Bruker's newest addition to its FT-IR microscopy line-up: the LUMOS II. Usability, utility and performance are its main focus, providing >900 spectra per second, PermaSure+, full automation and 100% reliability. Watch our product movie here.

INVENIO is Bruker's platform solution to FT-IR. It offers research grade multispectral performance from FIR to VIS/UV. Coupled to the HYPERION II FT-IR imaging microscope it gives access to FPA imaging technology.

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