

sisu CHEMA

SisuCHEMA brings simplicity and speed combined with superior performance. The system is modularly designed and is a complete chemical imaging solution. SisuCHEMA employs a push-broom imaging technology, which provides several outstanding advantages for the user: highest speed, lowest heat load from illumination and no limitations in the square or rectangular sample shape. Also a series of samples can be imaged in a single linear scan.

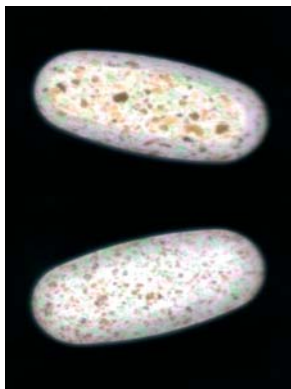
Applications

- Process Analytics
- Life Sciences
- Pharmaceutical Process Control and Quality Assurance
- Food or Dairy Process Control
- Fermentation and Coagulation
- Agricultural Material Screening
- Fat Content Measurement
- Granule Size and Size Distribution
- Forensics



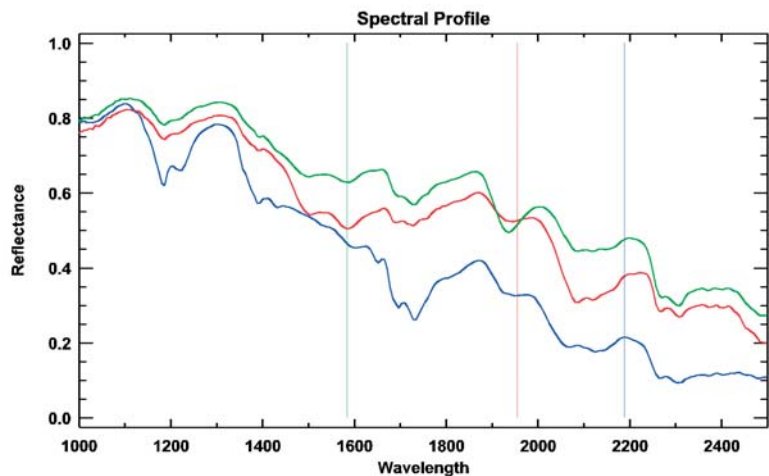
SisuCHEMA imaging module

320 pixels



430 pixels

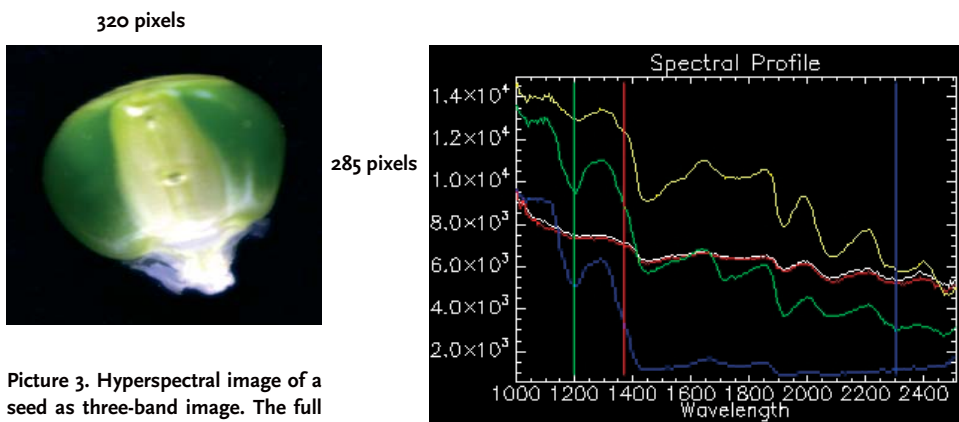
Picture 1. False color visualization of tablets showing differences in ingredient distribution. The full hyperspectral image (data cube) with 320 x 430 spatial pixels and 256 spectral bands in 1000 - 2500nm was acquired in less than 6 seconds.



SWIR spectra from three different ingredients within the tablets.

Spectral Images in just a few seconds!

Due to rapid imaging and the low heat load from the illumination sisuCHEMA is ideal for chemical imaging of biological samples.



Picture 3. Hyperspectral image of a seed as three-band image. The full hyperspectral image was acquired in less than 11 seconds.

Acknowledgement to the Department of Food Science, University of Stellenbosch, South Africa

Reflectance spectra in 1000-2500 nm picked from various locations on the seed.

Near Infrared (NIR) spectroscopy is widely used for chemical material analyses. SisuCHEMA combines NIR spectroscopy with high resolution imaging; it provides detailed information on the chemical components, their quantities and distributions within the sample. It is invaluable information for the characterization and quality assurance of advanced materials, where the functionality of the material is dependent on its chemical and physical structure.

HOW SISUCHEMA WORKS

SisuCHEMA is a complete chemical imaging workstation. Users place samples into specially designed sample trays, then using the ChemaDAQ data acquisition software, the spectral image is acquired and saved in real-time. Each sisuCHEMA workstation is pre-installed with the Evince hyperspectral image analysis software. This allows users instant application processing, chemical calibrations and predictions directly within the sisuCHEMA system.

Designed as a modular system, users can easily adapt the configuration of SisuCHEMA for a variety of sample sizes. The system can image samples of 10 mm or smaller at a very high pixel resolution of 30 microns, or the width of the sample area can be increased to 100 mm, providing 300 micron resolution. SisuCHEMA can also scan the samples up to 40 mm in thickness.

SisuCHEMA acquires imagery in a push-broom manner, meaning it builds the image one line at a time while the sample is scanned on a moving sample tray. Each line has a 320 pixel field of view. In the scanning dimension, the number of pixels is dependent on the selected scanning length. The variable scanning length allows the user to image longer samples, or multiple sequential samples (like tablets), in a single linear scan.

PERFORMANCE, EFFICIENCY AND EASE OF USE

SisuCHEMA is built on SPECIM's Spectral Camera operating in 970 to 2500 nm range with high spectral resolution. This push-broom camera provides outstanding advantages. Its light throughput is 10 to 20 times higher than that in a comparable tuneable filter imager. The result is considerably faster imaging under similar illumination conditions.

Furthermore, push-broom imaging only requires line illumination on the sample, which significantly reduces the heat load on the sample. SPECIM's unique line illumination technique is designed to provide diffused line-illumination on the sample, thus optimizing the imaging of various surfaces.

SisuCHEMA's simple, user friendly, modular methodology,

SisuCHEMA performance specifications

Optical and technical characteristics	SWIR	NIR
Operation mode	High speed push-broom hyperspectral	
Spectral range	970 - 2500 nm	900 - 1700 nm
Spectral sampling/ pixel	6.3 nm	4 nm
Spectral resolution	10 nm	6 nm
# spatial pixels/ line	320	
Pixel size on sample	Scalable from 30 to 300 microns	
Field of view on sample	Scalable from 10 to 100 mm	
Maximum sample size	100 x 100 x 40 mm (WxLxT)	
Scanning rate	100 hyperspectral line images/ s (max), corresponding to - 3 mm/s with 30 micron pixel - 30 mm/s with 300 micron pixel	
Typical scan time	3 to 10 s for an image with 320 x 320 spatial pixels and full 256 spectral bands	
Illumination	SPECIM's diffused line illumination unit	
Data format	BIL file format, Evince end ENVI compatible	
Instrument calibration	Instrument is delivered with spectral calibration. Image data is automatically calibrated to reflectance by measuring an internal standard reference target before each sample scan.	

brings out the best qualities of a turnkey solution in a form which is simple to use and maintain. Setting up SisuCHEMA for the first time only requires connecting the cables between the imaging unit and the external enclosure (housing the computer, camera controllers and power units). SisuCHEMA is supported by readily installed ChemaDAQ data acquisition software and Evince hyperspectral image analysis software.

FROM LAB TO PROCESS

Using a push-broom hyperspectral camera, SisuCHEMA works like a high speed line-scan camera. It acquires and builds the spectral image of a moving sample line by line, and simultaneously acquires all wavelengths for each line. Thus, this imaging technique is also an ideal solution for on-line process monitoring, where samples are in continuous motion. This provides still another significant advantage to the SisuCHEMA user – the applications that were initially developed for sample analysis in laboratory and near production lines can be directly moved to the real time world of on-line process and quality control. There is no need to adapt to and invest in different technologies for on-line monitoring.

SPECIM SisuCHEMA is the only chemical imaging technique offering a direct application path from laboratory to real time process.

EVINCE - ANALYSING THE IMAGE

Evince is used for the exploration of hyperspectral image data. Its graphical user interface allows importing of images created by ChemaDAQ and various other image formats. Using Evince's powerful multivariate analysis methods, the user can efficiently extract relevant information from the data cube. Numerous visualizations are available for both raw and processed data. Immediate visualizations of changes in data and a streamlined workflow make the exploration fast and effective.

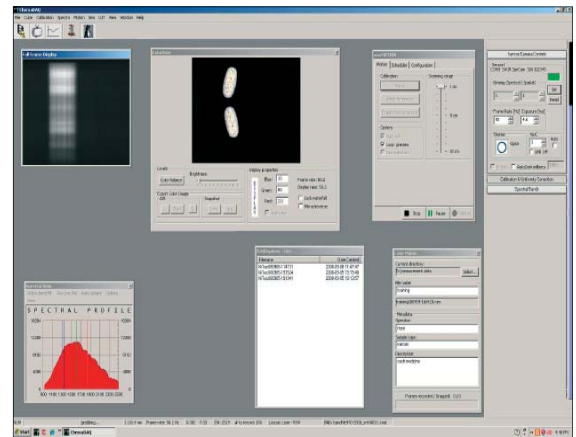
FUNCTIONALITY

- Full exploration of hyperspectral image data and spectral analysis of each pixel
- Compression of image data with multivariate techniques such as PCA and PLS (discrete and continuous) into multivariate models
- Visualizations available for raw spectra, pre-processed spectra, an entire measured channel and modelled image data (model components)
- Classification of image content
- Quantification of image content
- Segmentation of image content, for example background removal
- Detection of important wavelengths

For more information, or to download a full-featured trial version, visit www.umbio.com.

ChemaDAQ

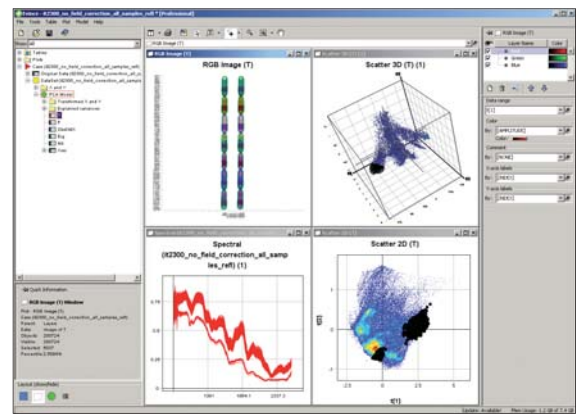
This combined user interface and data acquisition tool is delivered with SisuCHEMA. It provides users with the basic tools necessary for system control, data acquisition and data management.



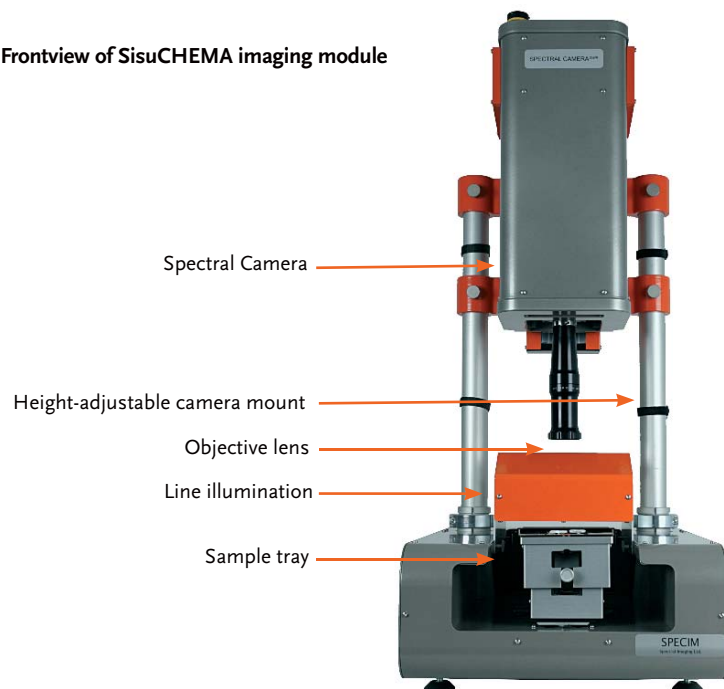
Evince

For exploration of hyperspectral image data.

More detailed information can be found in the UmBio Evince brochure.



Frontview of SisuCHEMA imaging module



SPECIM IS A WORLD LEADING COMPANY for hyperspectral imaging instruments, from UV through VNIR and SWIR up to LWIR (long wave infrared).

We provide ImSpector imaging spectrographs, Spectral Cameras and hyperspectral imaging solutions to a rapidly increasing number of industrial OEM customers and a large scientific clientele. SPECIM'S AISA FAMILY of airborne hyperspectral sensors provides market leading solutions for remote sensing, from small UAV systems to full featured commercial, research and military remote sensing tools.

Our hyperspectral products are known for the highest performance at the lowest budget in the market. They are used in an increasing range of demanding applications like color, Process Analytical Technology (PAT), life sciences, chemical imaging, pharmaceutical, military and security.



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