Lightnovo

miniRaman microscope

world's smallest confocal Raman microscope for chemical and structural analysis

https://lightnovo.com
Blokken 15, 1. tv.
3460 Birkerød
Denmark (DK)
+45 71 37 04 10


Lightnovo
miniRaman microscope based on our miniRaman spectrometer which is integrated inside microscope body. Similar to miniRaman spectrometer, it makes Raman shift and Raman intensity calibration during each spectrum acquisition.

SPECIFICATIONS

Lasers

• **785 nm** (power range from **18** to **176 mW** on a sample)

• **660 nm** (power range from **1** to **32 mW** on a sample)

Spectral Range

• **400-2700 cm^{-1}** (at **785 nm** laser exitation)

• **2750-4500 cm^{-1}** (at **660 nm** laser exitation)

Spectral Resolution

• **7-15 cm^{-1}** (slit size dependent; slit size can be customized)

Sensitivity in point mode at laser wavelength 785 nm

(determined as SNR of polystyrene spectrum)

• SNR **350:1**

• spectral range **400-2700 cm^{-1}**

• laser wavelength **785 nm**

• laser power **100 mW**

• integration time **0.1 s**

• number of repetitions **1**

Sensitivity in point mode at laser wavelength 660 nm

(determined as SNR of polystyrene spectrum)

• SNR **150:1**

• spectral range **2750-4500 cm^{-1}**

• laser wavelength **660 nm**

• laser power **32 mW**

• integration time **0.5 s**

• number of repetitions **1**

Physical dimensions and weight

• weight **7 kg**

• dimensions **120 mm x 120 mm x 280 mm**

Spatial Resolution

• Diffraction limited (microscope dependent)

• **600 nm** at **660 nm** excitation at NA=**0.95** (100x)

• **750 nm** at **785 nm** excitation at NA=**0.95** (100x)

White light illumination

• Reflected light microscopy with simultaneous laser spot visualisation and Raman spectra registration

• Transmission light microscopy with simultaneous laser spot visualisation and Raman spectra registration

• Off-axis illumination microscopy with simultaneous laser spot visualisation and Raman registration

Microscopy configuration mode

• Upright

• Inverted

TECHNOLOGY

Lightnovo is proud to present our world's smallest confocal Raman microscopes for laser wavelengths: **660 nm** and **785 nm.** miniRaman microscopes have a foot print of **12x13 cm**, provide diffraction limited spatial resolution, extremely high throughput and additionally equipped with transmitted, reflected and side-illuminated visible light microscopy on separate camera sensor. Due to the unique, patented technology miniRaman microscope has very high throughput, wavenumber accuracy and Raman intensity control via in-build reference channel.

miniRaman microscope can be used in upright microscopy and inverted microscopy configurations. All what is need for switch between modes – flip the device from top to bottom.

miniRaman microscope technology has been developed for Raman microscopy in near IR range from laser source at wavelengths 660 and 785nm. miniRaman microscope is based on our miniRaman spectrometer, which makes Raman shift and Raman intensity calibration during each spectrum acquisition. This makes miniRaman microscope much less expensive than typical Raman microscopes with frequency stabilized lasers.

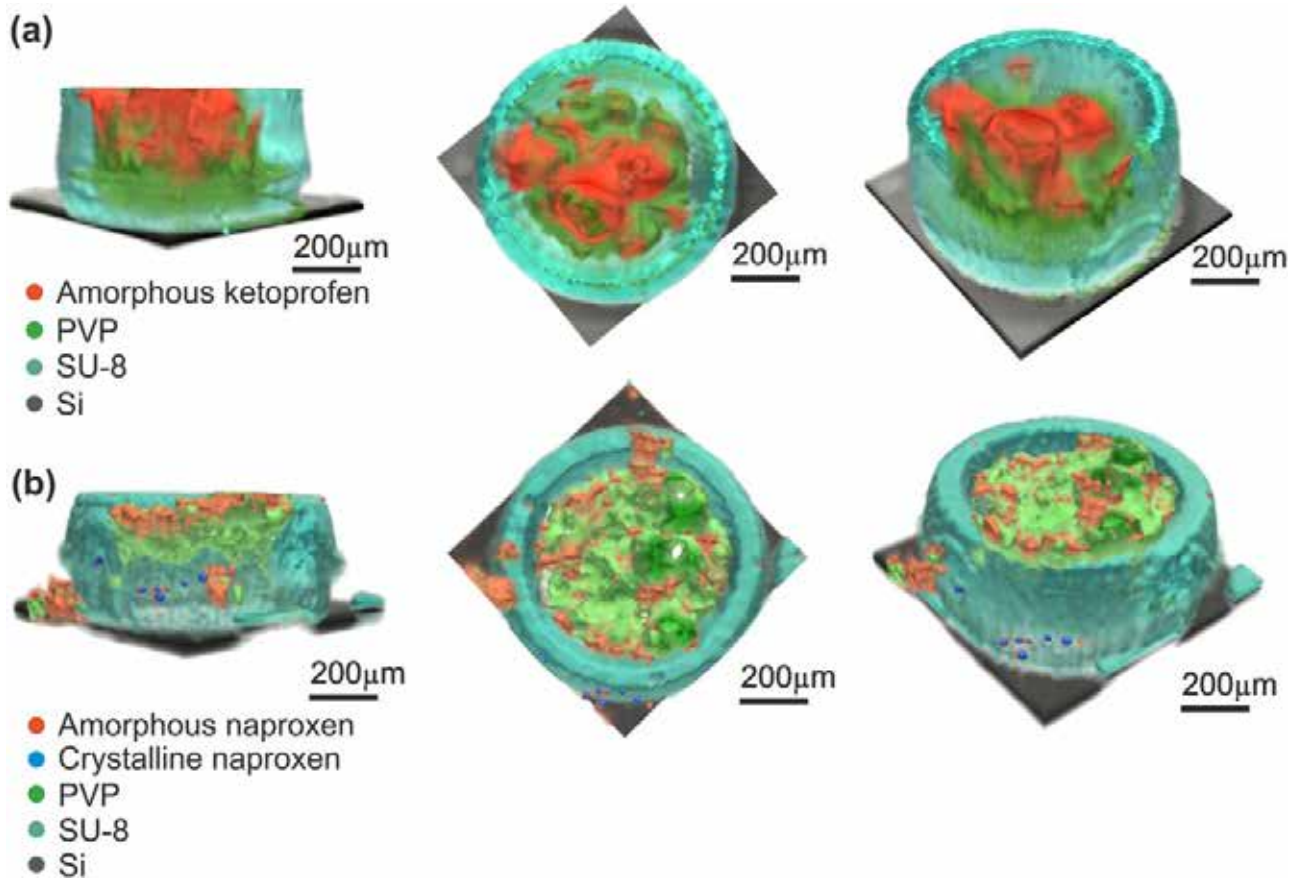
APPLICATIONS

3D Raman imaging

Due to high sensitivity of miniRaman microscope it is suitable for 3D chemical imaging of multicomponent materials which are transparent/partially transparent for a laser beam. Here we present an example of combined volumetric chemical maps of the microcontainers (MC) used for oral drug delivery. After multivariate curve resolution analysis of volumetric Raman map it is possible to conclude that PVP (polymer) was homogeneously distributed throughout the MCs, amorphous ketoprofen was deposited on the top of MCs walls and over the surface of PVP and the Si substrate response was recorded only at the bottom of the map.

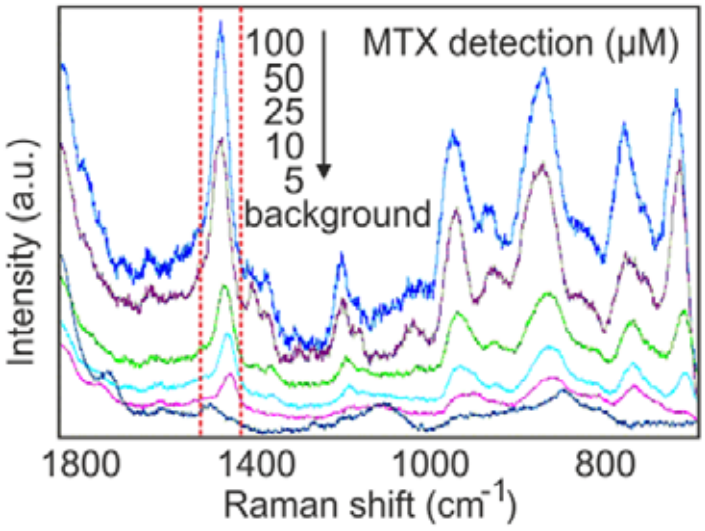
read more here https://doi.org/10.1002/jrs.5869

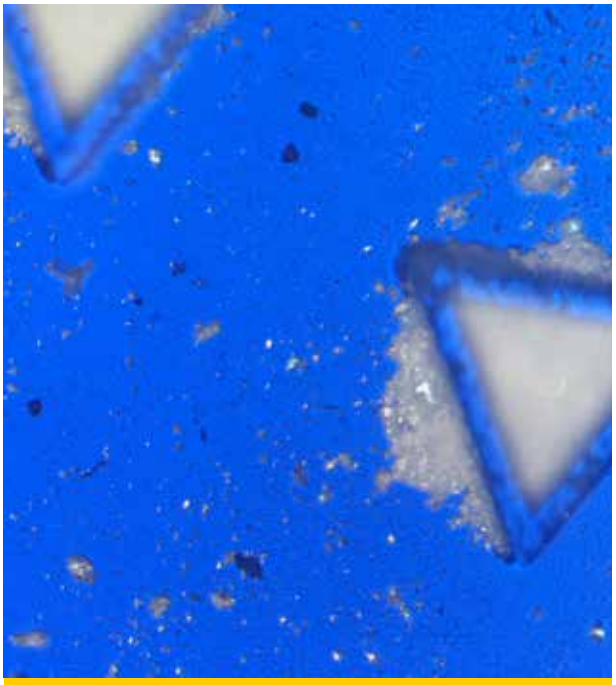
Combined volumetric chemical maps of MCs loaded with ketoprofen (a) and naproxen (b) are shown from different rotation angles



Typically, if Raman active molecules display high affinities toward a SERS surface, satisfactory SERS signals can be obtained. However, a multitude of important molecules, such as p-coumaric acid and glucose do not bind to nanoplasmonic surfaces. In these cases, obtaining reliable SERS spectra already at concentrations <1 µm is a challenging task. The SERS signal intensity is low and typically comparable to the SERS substrate background originating from, for example, surface contaminants. Here, large area SERS mapping is highly suitable.

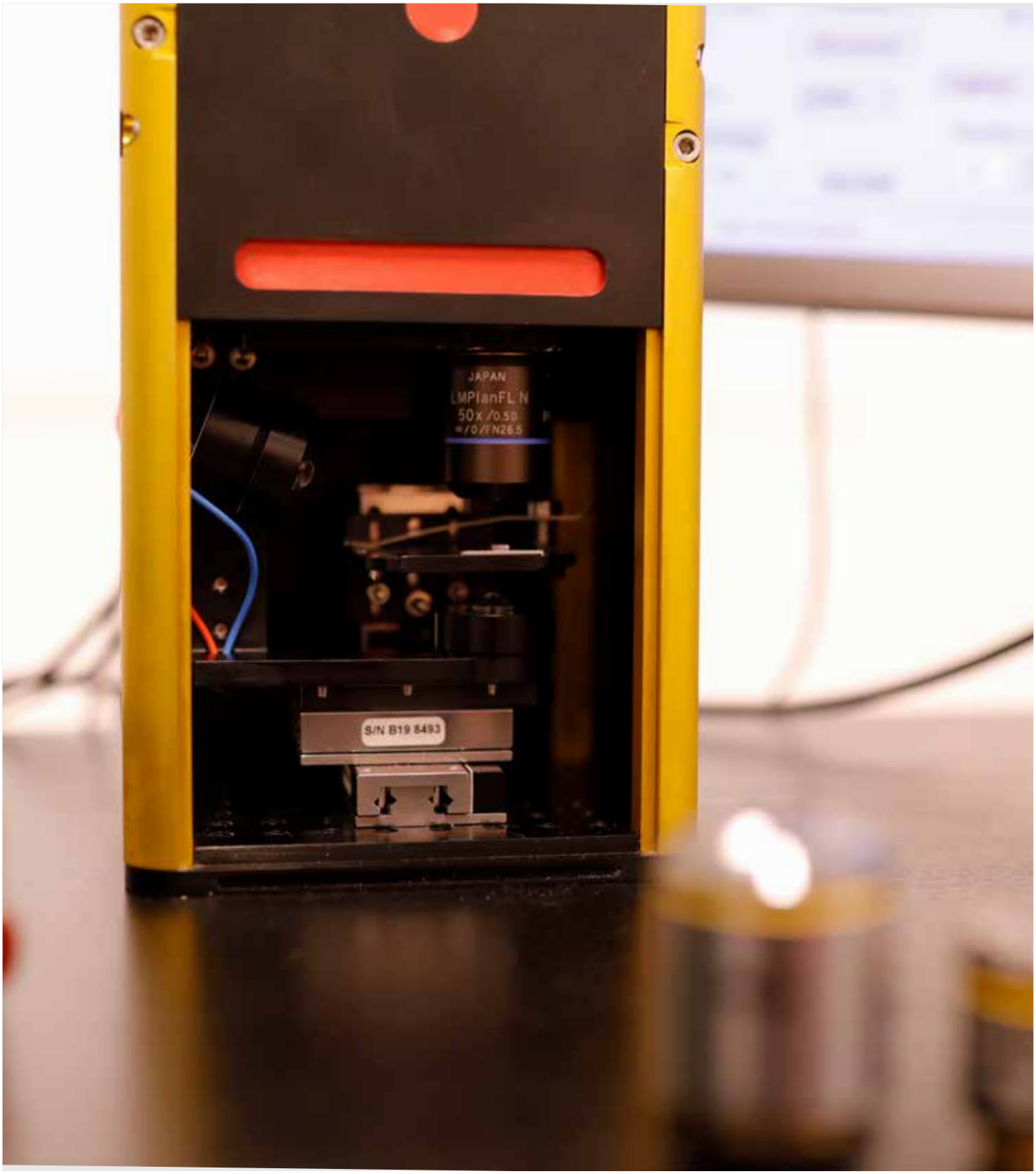
Here we demonstrate an example of SERS mapping of methotrexate (MTX), see SERS spectra to the right.





Detection of chemotherapeutic drugs using SERS mapping

Surface-enhanced Raman spectroscopy (SERS) is a well-established analytical tool in various biosensing applications that allows detection of analytes down to the single molecule level. It has been shown that the dominant part contributing to SERS is the electromagnetic (EM) enhancement mechanism, which is based on extreme amplification and localization of the incoming optical field by metal nanoparticles that support localized surface plasmon resonance (LSPR). Efficient LSPR coupling between nanoparticles leads to EM enhancement factors >10^8. Sites containing highly confined optical fields in the vicinity of metallic nanostructures are often referred to as the EM "hot spots."



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Lightnovo ApS

Blokken 15, 1. tv.
3460 Birkerød
Denmark (DK)
CVR: 40979603

+45 71 37 04 10
info@lightnovo.com
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