Lightnovo

Miniaturized Raman

spectrometers and microscopes

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Scientist

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About Lightnovo ApS

Founded 2019

Lightnovo's Mission

Democratize the power of high-end Raman spectroscopy for the benefit of mankind.

Located in Birkerød, Denmark,

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Products Overview miniRaman

Spectrometer and microscope

Compact, high performance for mass market

miniRaman

spectrometer

miniRaman

microscope

Precise

Focusing stage

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Products Overview RG Raman

Spectrometer and microscope

R&D performance/price leader

RG Raman

microscope

RG Raman

spectrometer

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Products Overview THOR

Advanced R&D Raman microscope

Overall Raman performance leader

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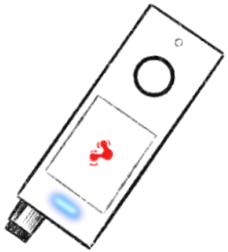
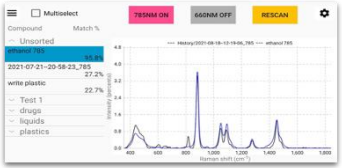
The basics of Raman technology

Raman Spectroscopy





Probing of sample with laser

Solid, powder, liquid probing through container

Signal generation

Signal collected by analyzer transmitted wirelessly

Signal analysis

Spectrum is the “fingerprint” of the sample substance (on smartphone, tablet or PC)

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Miniaturization without quality compromise

Miniaturization and cost reduction has enabled high-quality cameras to become a broadly available consumer product manufactured in the billions of units.

High-quality cameras

- Sales DSLR + mirrorless
- ~7M units in 2022

Smartphone camera

- Reduce size, cost
- Keep high performance
- Sales ~1.3B units in 2022

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The Solution

miniRaman - Patented Technology

Overall Raman performance leader

Quick Start

Operation readiness - 5 seconds

Small Size

To be carried on belt - 100 x 40 x 30 mm

Price

From 10,000 €

Reliable

No need for calibration High ID power

WO2019145005 - An apparatus for carrying out Raman spectroscopy

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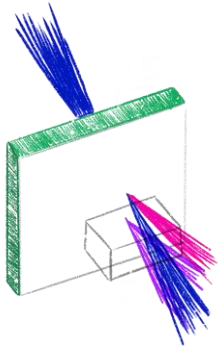
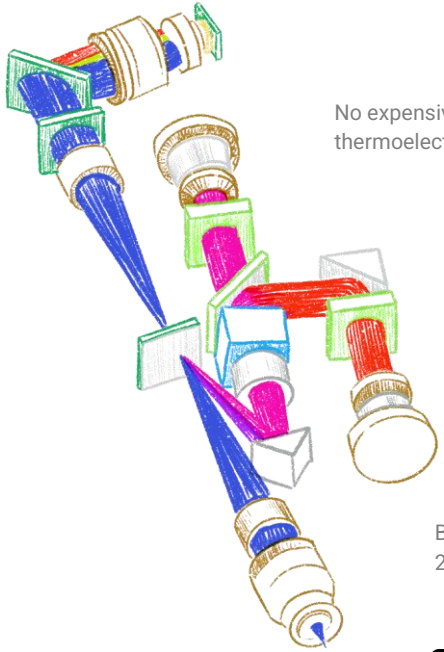
IP and unique benefits

Technology developed and patented in DTU

Dual-range spectrometer using two lasers:
785 nm (400…2700 cm^{-1})
660 nm (2700…4500 cm^{-1})

In-build reference channel
(polystyrene)





No expensive
thermoelectric cooling

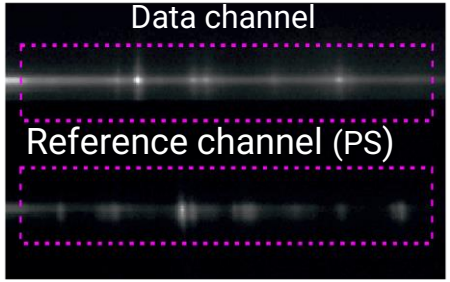
Battery powered,
2 hours operation

WO2019145005 - An apparatus for carrying out Raman spectroscopy

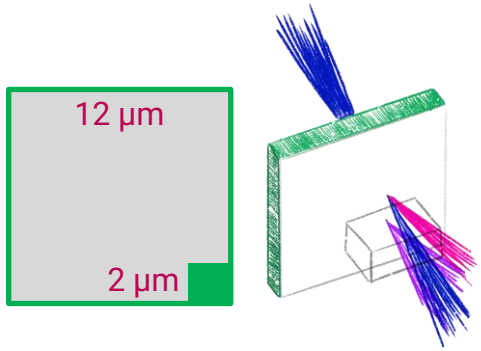
IP and unique benefits

1. High performance real-time XY calibration

Consumer-level
CMOS Sensor
2 µm pixel size



Confocal design (cross slit)



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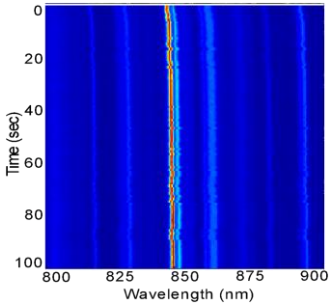
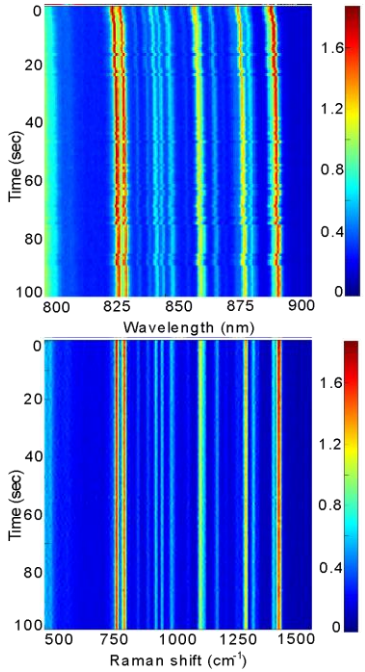
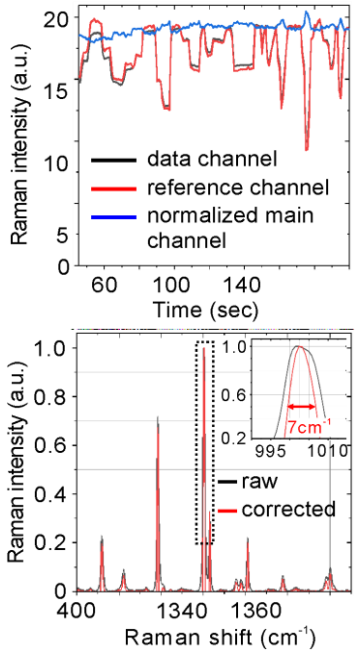
IP and unique benefits

1. High performance real-time XY calibration







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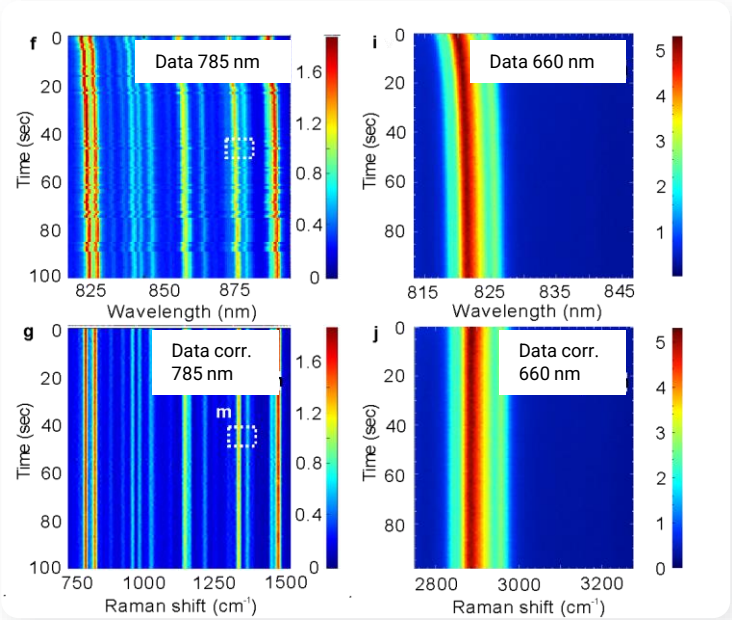
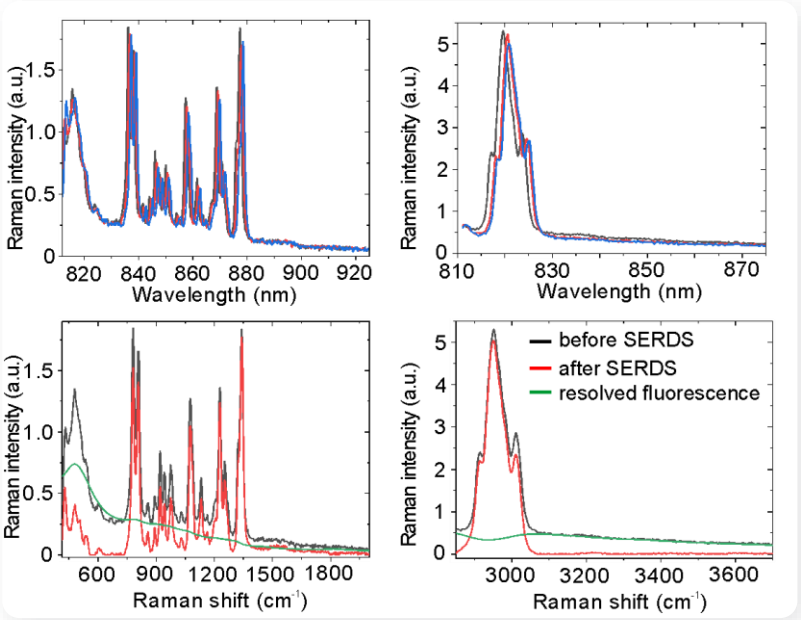
IP and unique benefits

2. SERDS





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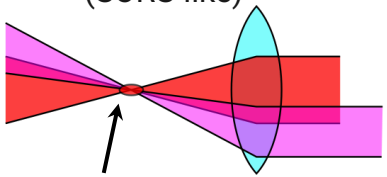
IP and unique benefits

4. Background suppression (SORS)

Off-axis alignment
(SORS-like)



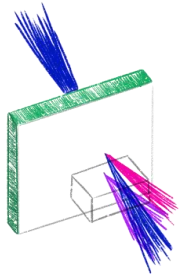
scattering

excitation

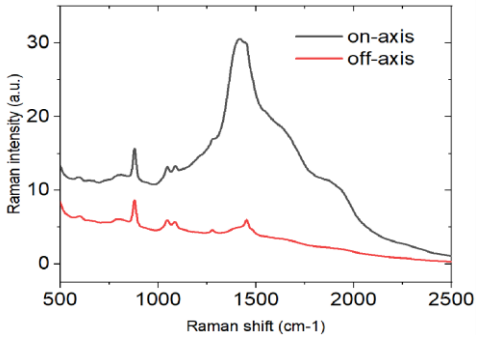
Most signal comes from intersection

Vertical slit

Confocal design
(cross slit)



Horizontal row



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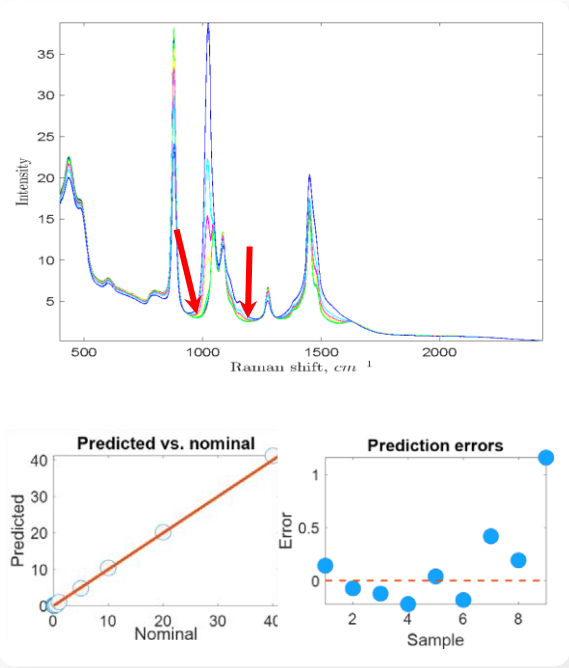
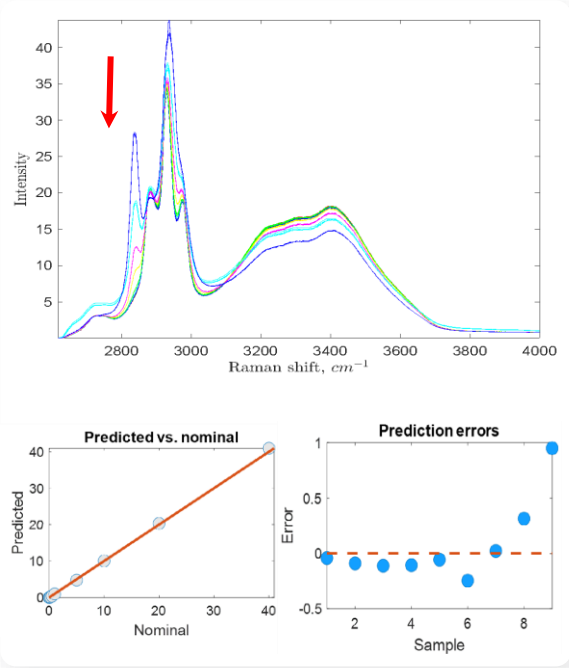
IP and unique benefits

Sensitivity test. Quantification of methanol.





LoD: 0.07%
LoQ: 0.21%

Best in literature
LoD: 0.25%

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miniRaman models

Spectral range: **2700 – 4000 cm^{-1} (660 nm)**
2550 – 4000 cm^{-1} (675 nm)
400 – 2700 cm^{-1} (785 nm)

MiniRaman Standard

One laser 785 nm, power on a sample 5-50 mW

MiniRaman Power

One laser 785 nm, power on a sample 10-90 mW

MiniRaman SERS

One laser 785 nm, power on a sample 0,5-15 mW

MiniRaman Standard Dual

Dual laser, power on a sample 5-50 mW (785 nm)
5-40 mW (660 nm)/ 5-75mW (675)

MiniRaman Power Dual

Dual laser, power on a sample 10-90 mW (785 nm)
5-40 mW (660 nm)/ 5-75mW (675)

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miniRaman accessories

Precise Focusing Stage

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Standoff accessory for miniRaman

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miniRaman on a drone

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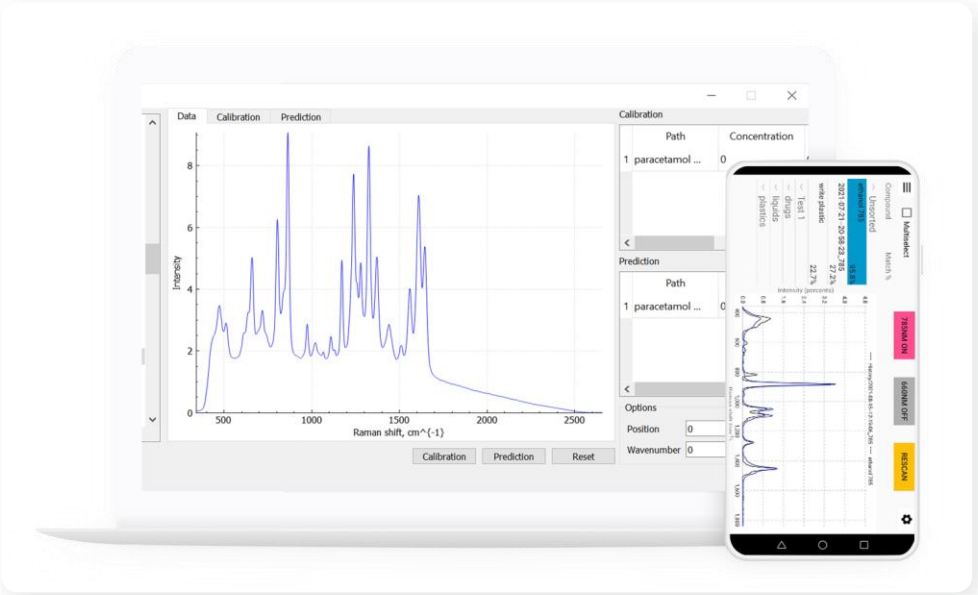
miniRaman Miraspec Software

- **Device**
- **Mobile**
- **Tablet**
- **Desktop**



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miniRaman spectrometer
Use cases

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miniRaman spectrometer
Use cases

Minerals

Skin analysis

Plants

Food

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miniRaman spectrometer
Use cases

Microplastics

Bacteria ID

Polymers

Art objects

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miniRaman microscope

World smallest and most cost-effective confocal Raman microscope for academia and industrial R&D

- **Incorporates miniRaman analyzer unit (removable) as module**
- **Patent protected IP (WO2019145005)**
- **Upright and inverted operation**
- **Ultra-compact (12x13cm, 9kg), low power, robust**
- **Built-in self-calibration and easy to use**

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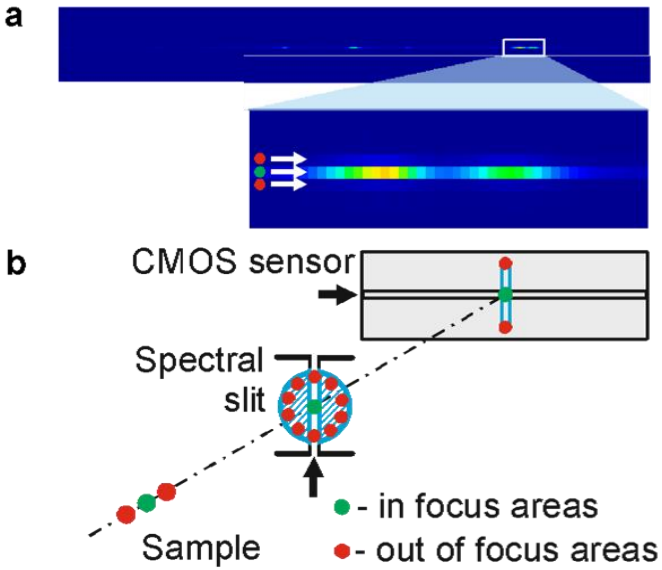

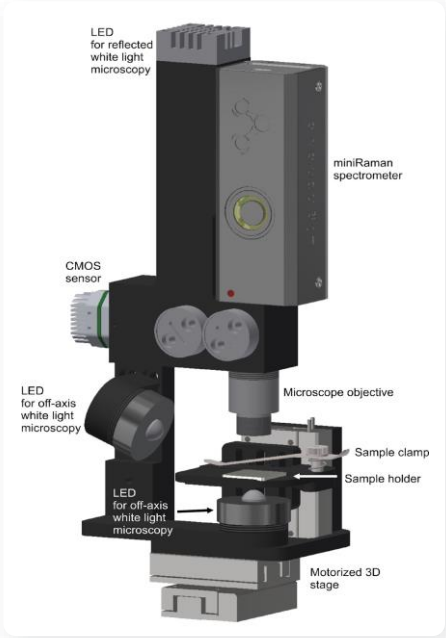

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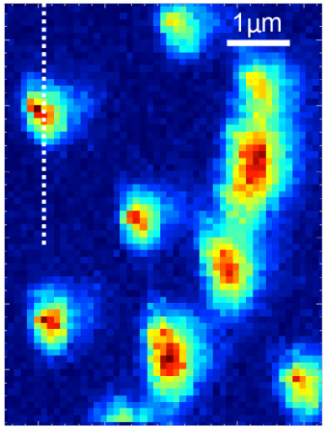
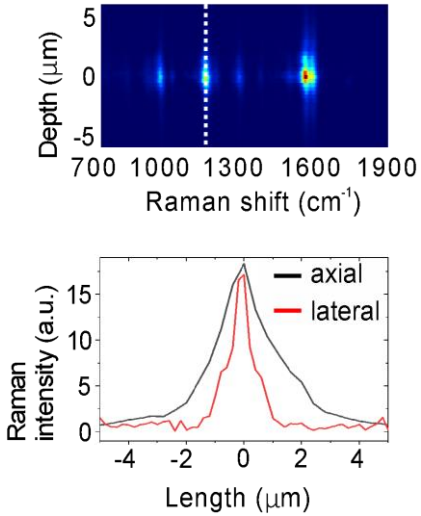
miniRaman microscope

Spatial resolution test



Polystyrene beads
at the size of 1µm



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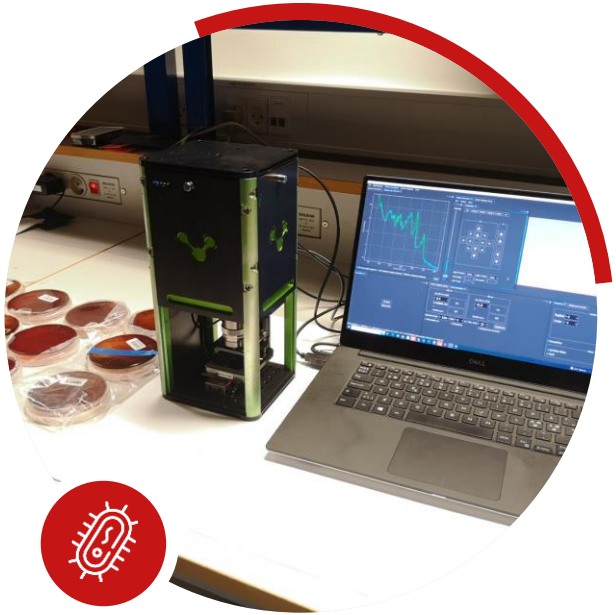
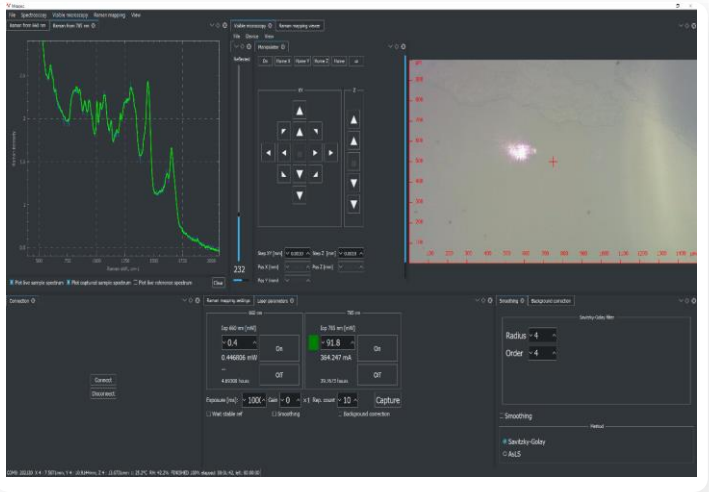
In-vitro bacteria Identification





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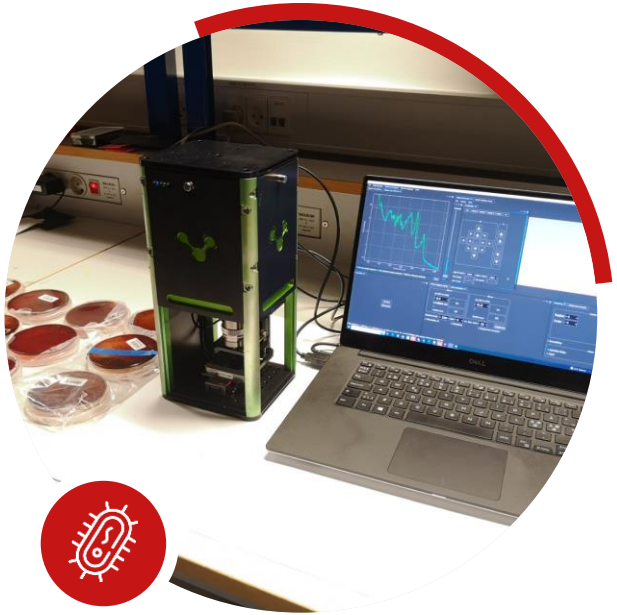
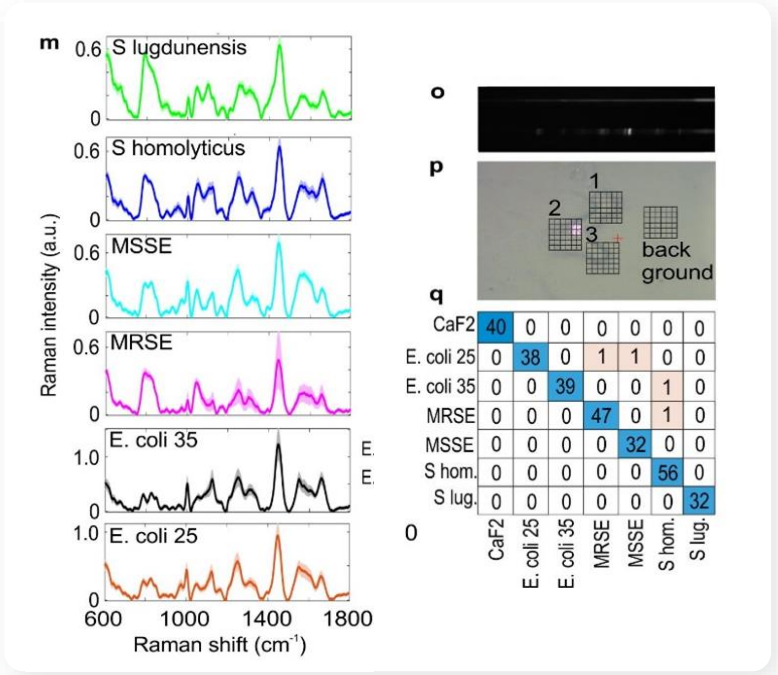
miniRaman microscope

In-vitro bacteria Identification





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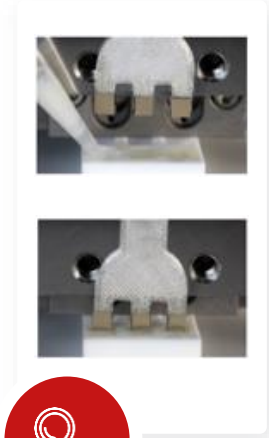
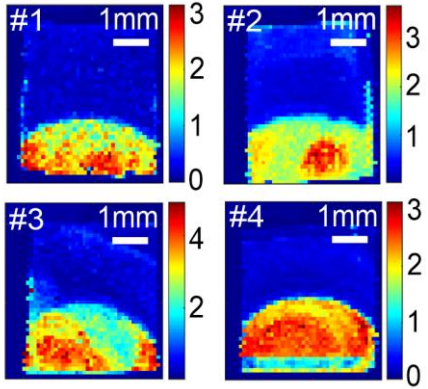
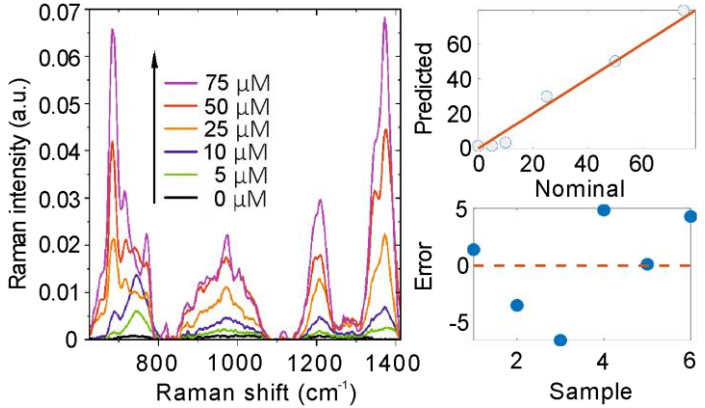
miniRaman microscope

Quantification of anti-cancer drug via SERS mapping







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We are open to collaboration

Thank you

Do you have any questions?

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