Live Demo Raman Microscopy

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JASCO (Nihon Bunko)
R&D and Manufacturing, Hachioji, Japan

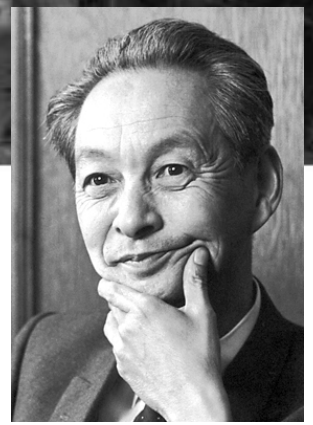
Founding Members

Established 1958 at the Optical Research Institute at Tsukuba University, Tokyo

Founding members include:

- World famous physicist Yoshio Fujioka
- Nobel Prize winner Shinichiro Tomonaga (1965 - Physics for QED with Richard Feynman)

JASCO in the USA, first incorporated in 1972.



Dr. Tomonaga

JASCO: Our Products

Presentation Overview

Jasco Raman Spectrometers

- NRS-4500 Raman Microscope

Quick **R**aman **I**maging (**QRI** - Fast Mapping)

- Sample micro polymer beads (Polymethyl acrylate and Polystyrene)

Advanced Search Function (micro particulate samples)

- Samples micro polymer beads and TiO2

Surface **S**canning **I**mage (**SSI –** Tilted or Uneven surfaces)

- Geological sample

JASCO Laser Raman Spectrometers

Portable Raman
Raman Probe

RMP-500

Standard model

NRS-4500

High-end models

NRS-5500

Flagship models

NRS-7500

QRI High speed imaging system

Focal length

20cm — **30cm** — **50cm**

One detector CCD/EMCCD

Quality control environment
Academia

Microplastics, multilayer materials, carbon materials, impurities , biological

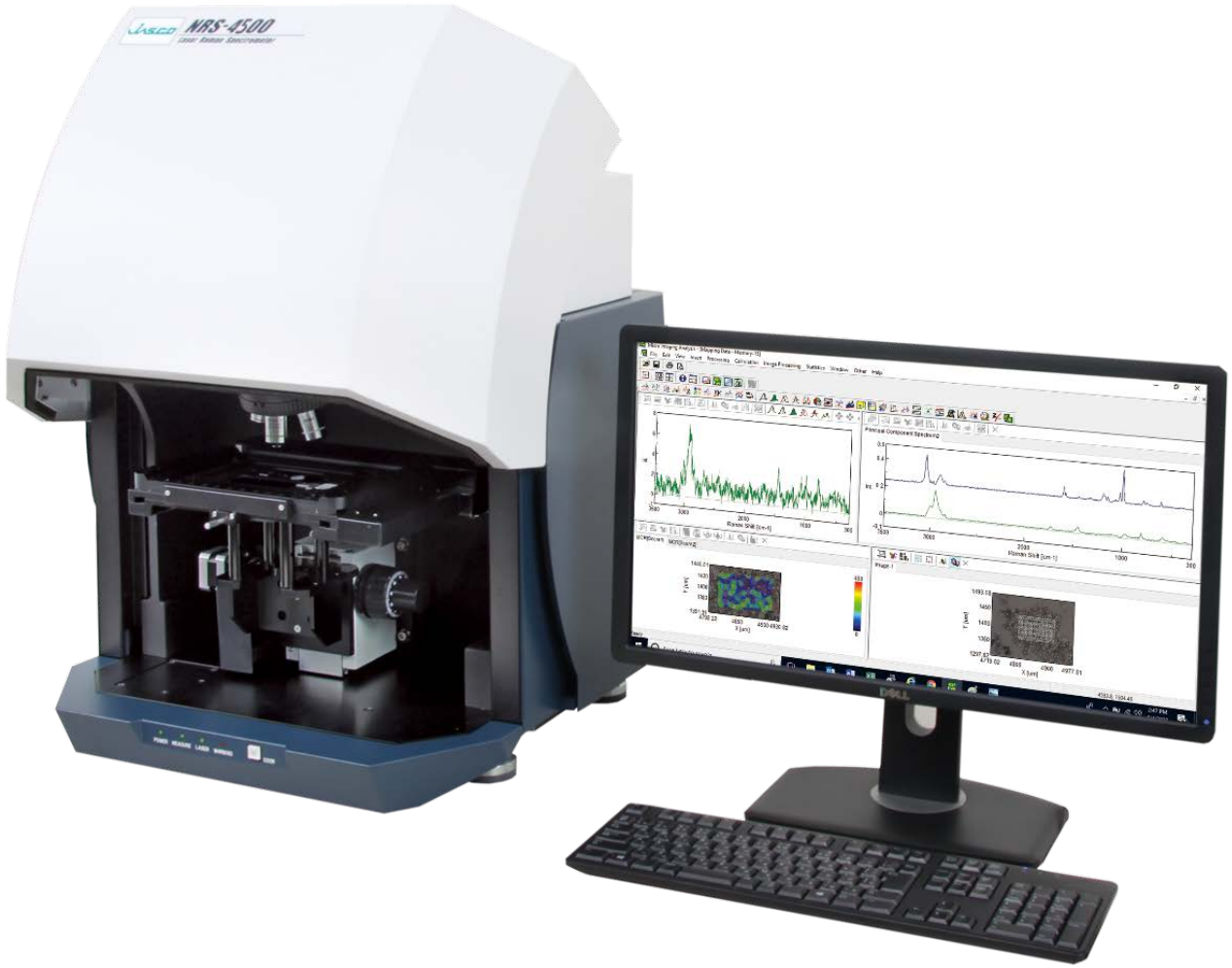
Dual detector CCD/EMCCD or InGaAs

Physical property evaluation（R&D）

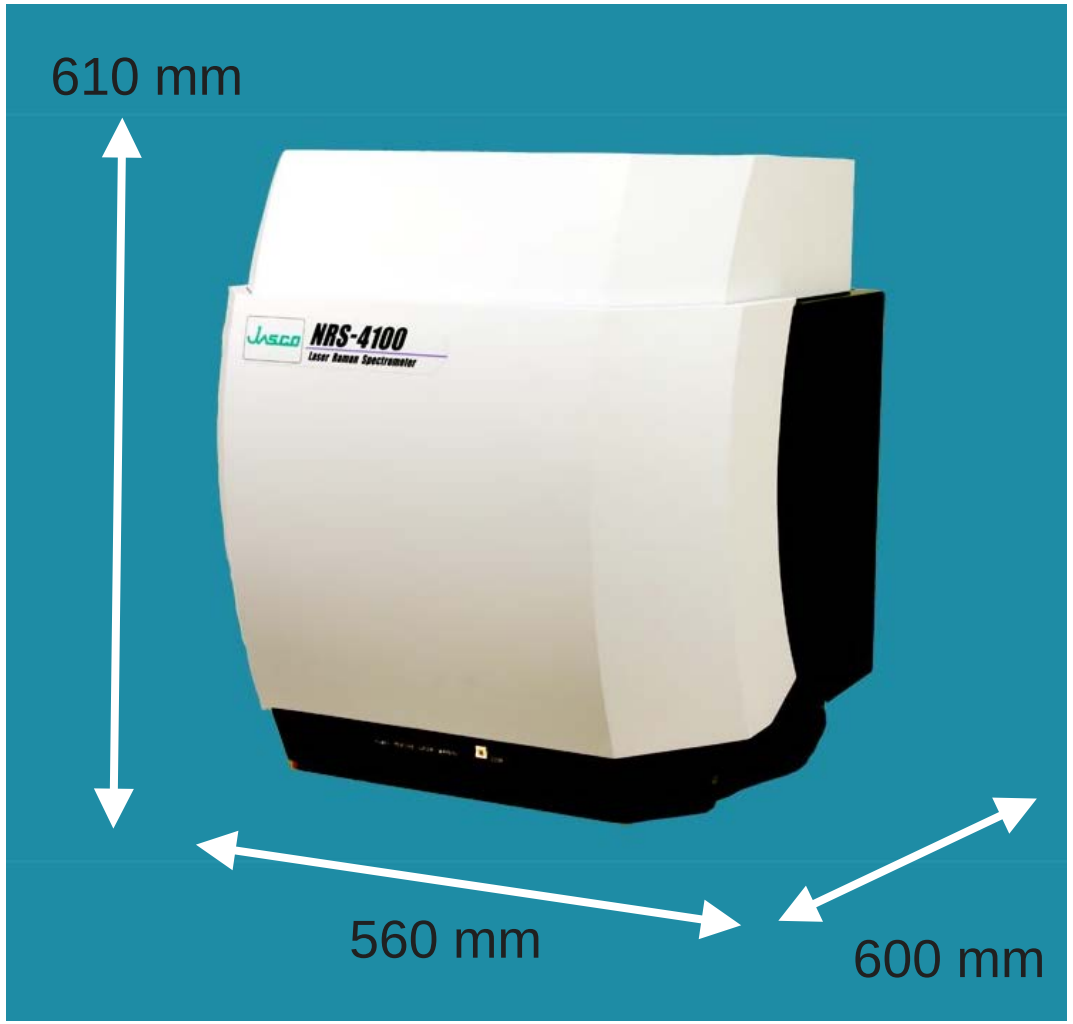
High spectral resolution
Low wave number measurement

Stress and impurities in semiconductor

NRS-4500 Raman Microscope



NRS-4500 Main Instrument



Weight: 55 kg

Features

Compact model

Function enhancements for new users

- **Automation**
- **Sample search**
- **Assist function**

Combination of usability and high-performance

Emphasis on performance

- **Spatial resolution**
- **Spectral resolution**
- **Signal to noise ratio**

Standard Configurations

Lasers (up to 3):	**532 nm and/or 785 nm**
Gratings (up to 4):	**900 gr/mm and/or 400 gr/mm**
CCD Detector:	**1650 x 200 pixel** **16 x 16 µm**
	Air cooled (-60ºC)
Stage	**Auto XYZ with joystick**
Rayleigh rejection:	**Edge filter (E-grade and notch as options)**
Objective lens:	**5x, 20x, 100x for Vis range (NIR as option)**

Advantages of NRS-4500: Part 1

Measurement wavelength range (Raman shift)

Standard: 8000 ~ 100 cm^{-1}
(532 nm +Edge filter)

Option：8000 ~ 50 cm^{-1}
(532 nm + E grade edge filter)

Advantages of NRS-4500: Part 2

Automatic alignment of laser and Raman path

- **Laser auto-alignment**
  Laser optical path can be aligned with one click in control software.

- **Raman light path auto-alignment**
  Automatic switching of Raman path imaging lenses*
  Auto adjustment when laser is switched.

*Imaging lenses

Two focal length imaging lens matched to the objective lens magnification. This ensure all the light is collected from the sample

Excellent S/N measurement from low to high magnification.

Advantages of NRS-4500: Part 3

Lasers

Standard: 532 nm and 785 nm (internal)

Options: 405, 442, 457, 488, 514.5, 532, 633, 785, 1064 nm etc.
(highlighted wavelengths are recommended lasers)

*** When using a 1064nm laser the detector is changed to InGaAs**

- **Up to three lasers can be installed (3 internal or 2 internal and 1 external)**
- **Automatic selection of laser optical path + Rayleigh rejection filter**

Advantages of NRS-4500: Part 4

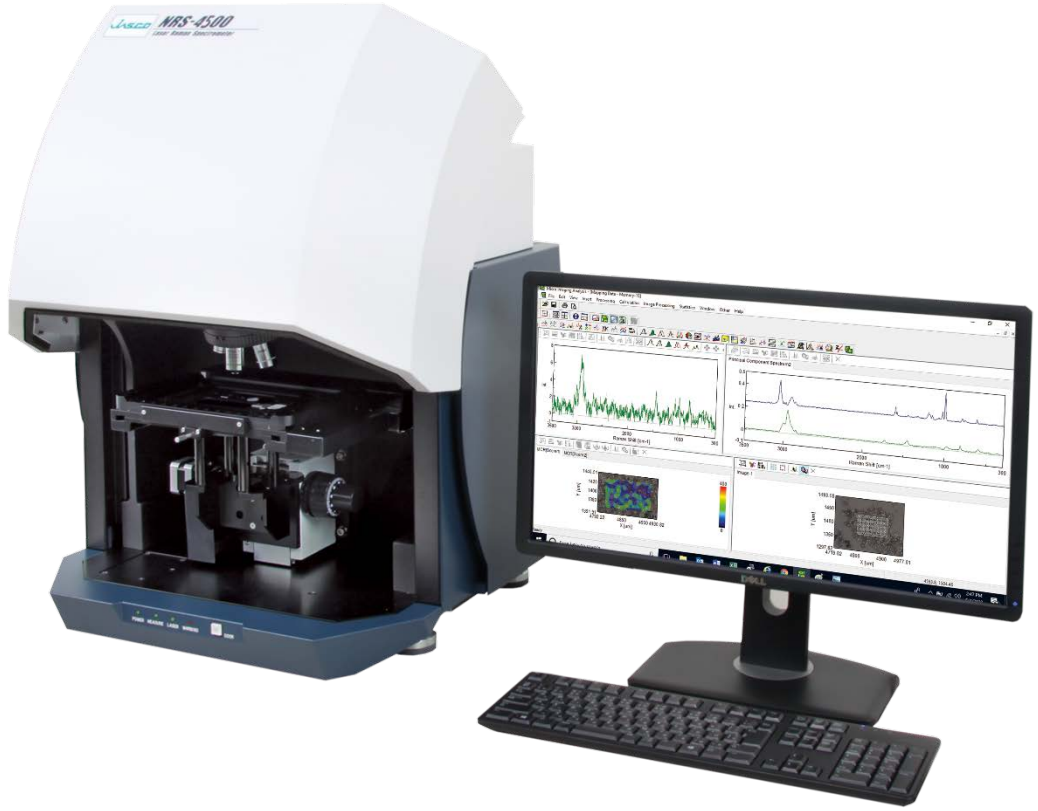
Excellent Spatial resolution

X and Y = 1 µm
Z = 1.5 µm

Using:
532 nm laser, 100X objective lens and 17 µm pin hole aperture

Importance of Class 1 Laser Safety

All operation is done behind a closed and locked automatic door.



Important considerations for ease of use, flexible analysis and reliable data.

Laser spot observation on sample
In most Raman systems the laser spot is not visible

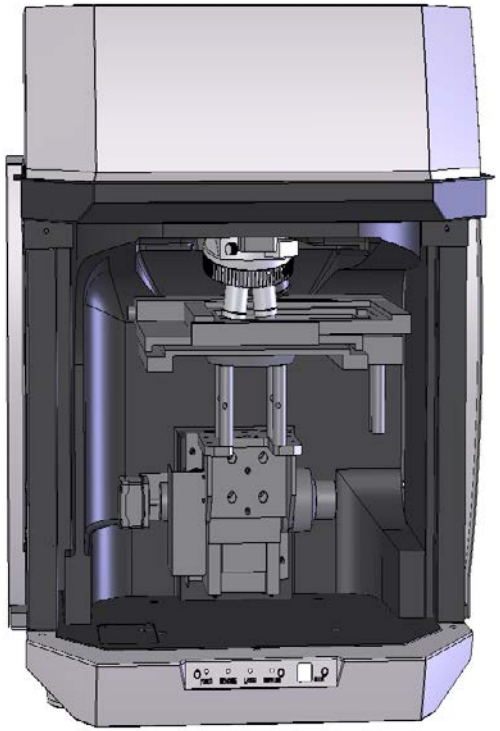
Switching between measurement/observation and laser selection is fully automatic with one mouse click
In most Raman systems, laser switching and switching between measurement/observation mode are manual

Measure sample or accessory up to 80 mm thick
Sample rotating stage, inactive gas inclusion cell, electrochemical cell, etc.

Microscope system is constructed in a high stiffness housing
Drift is minimized, in many Raman systems flex due to the attached microscope.

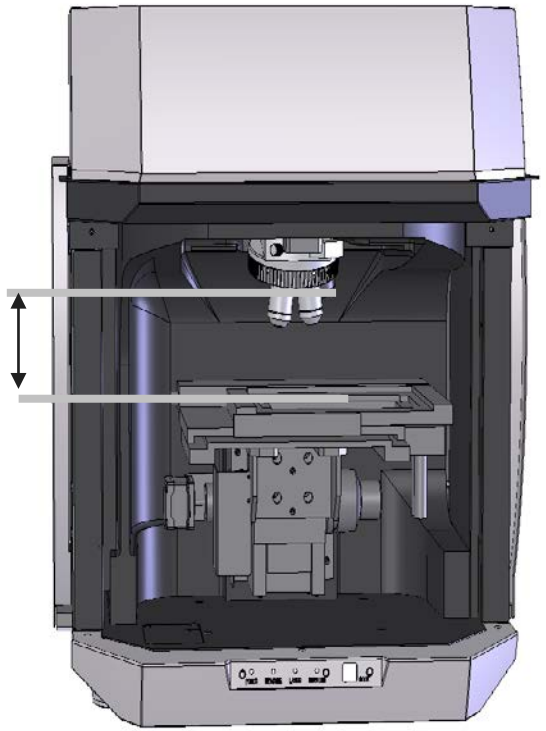
Larger stages and samples

Standard stage



special deep stage

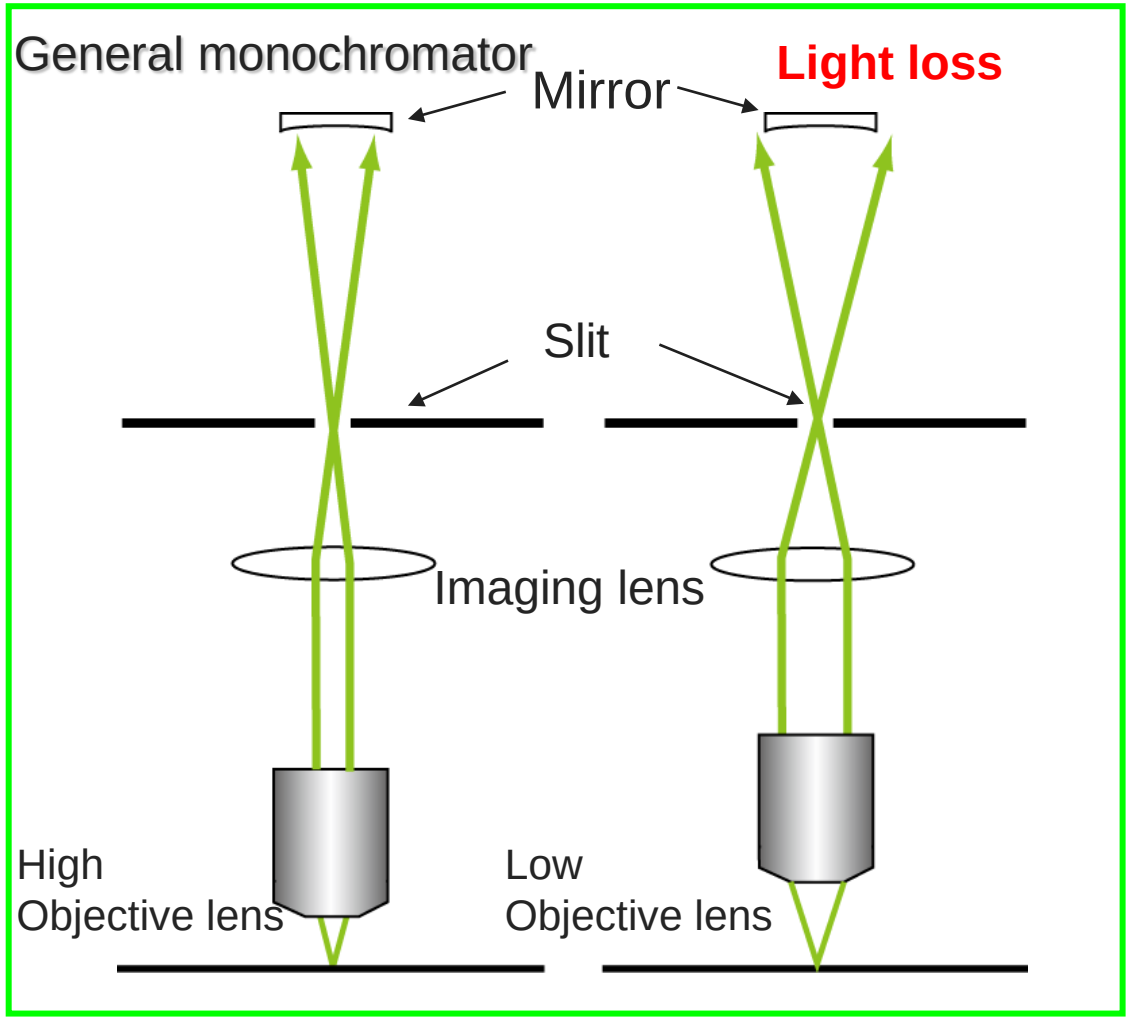
80mm



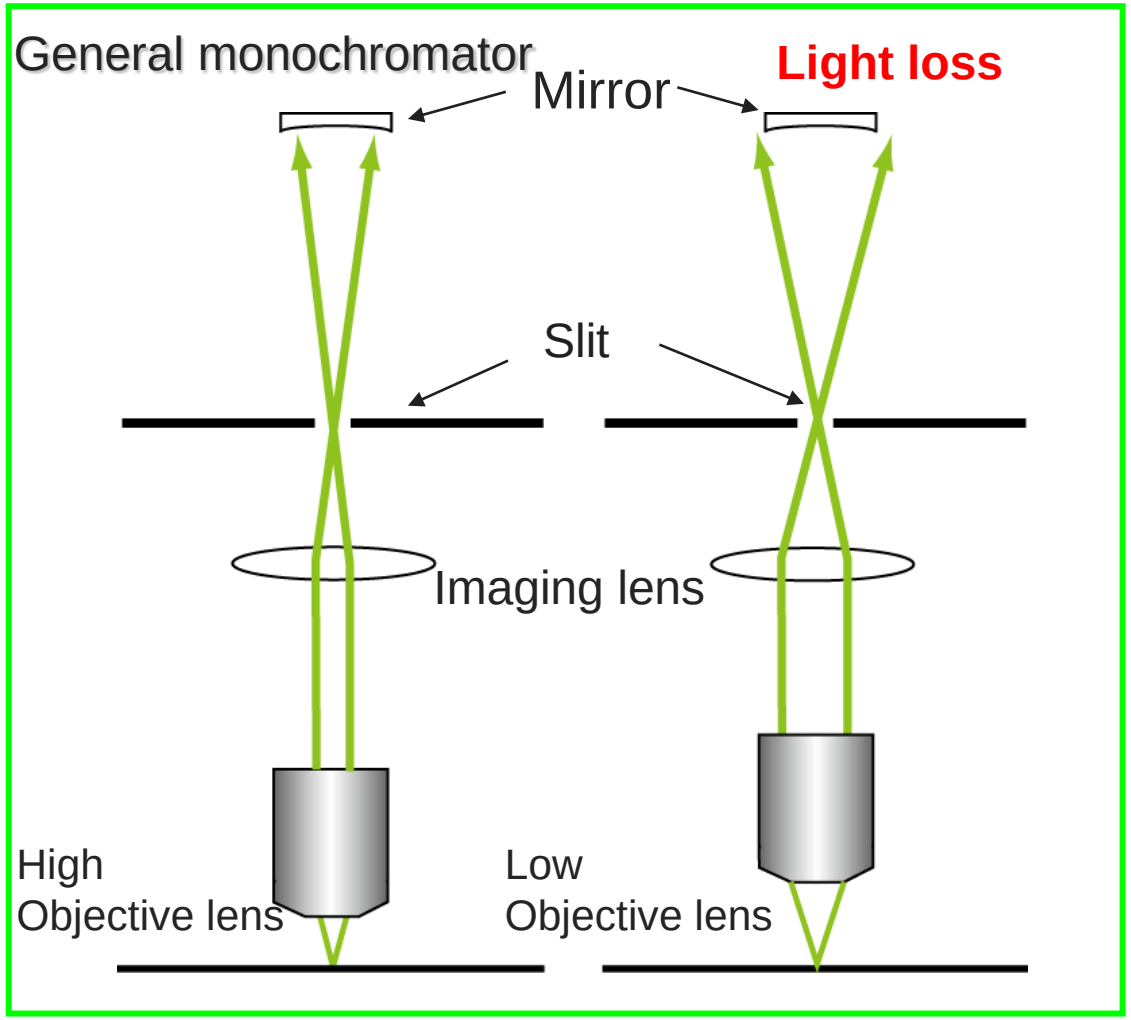
Uses

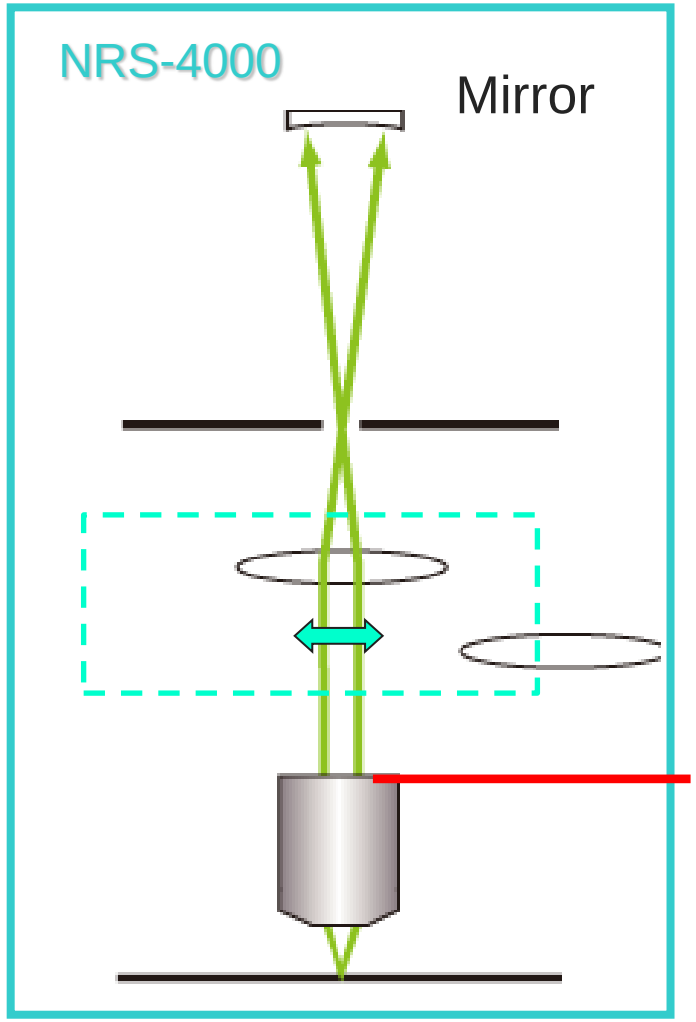
- Thicker samples
- Heating
- Cryostats
- Gas cells
- Environmental cells

Automatic Switching Imaging Lens



Automatic Switching Imaging Lens





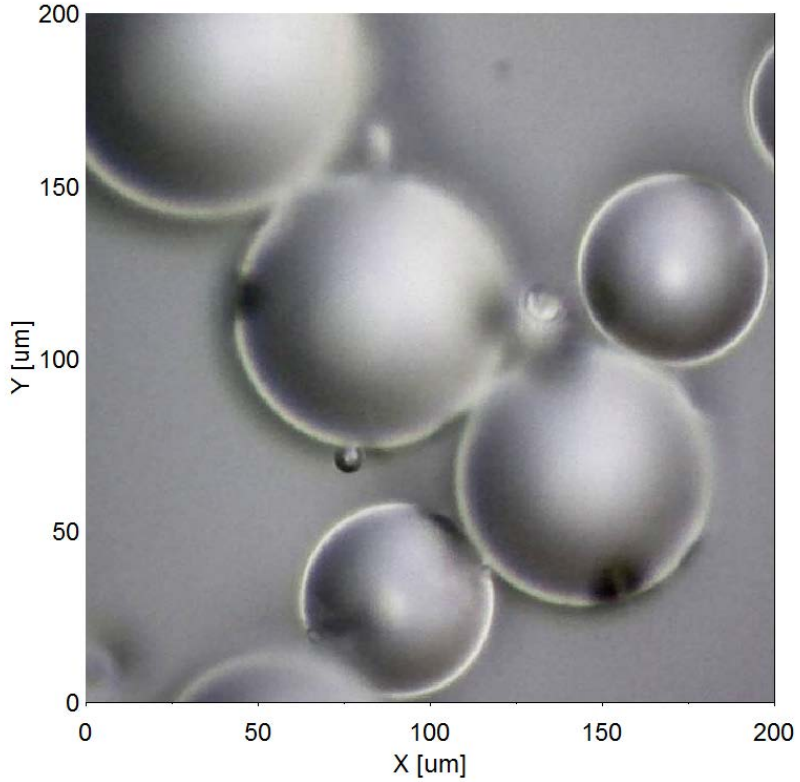
2 imaging lens are switched

Summary

- Compact with performance of larger research grade systems
- **Class 1** laser safety
- Measurement in **low wavenumber** region to 100 cm^{-1} (option: 50 cm^{-1})
- Automatic **optimization** of laser alignment and Raman optical path
- **High S/N** ratio can be obtained with each objective lens by auto selection of optical imaging lens
- Maximum **3 lasers** of 457, 532, 785 (typical); options from 405-1064 nm
- Excellent **spectral resolution** (typical 2cm^{-1} per pxl)
- Automation of exchange of laser rejection filter and optical path
- Excellent spatial resolution: **XY: 1 µm, Z : 1.5 µm**

Measurement Samples - Quick Raman Imaging

PMMA : poly methyl-methacrylate
PS: Polystyrene



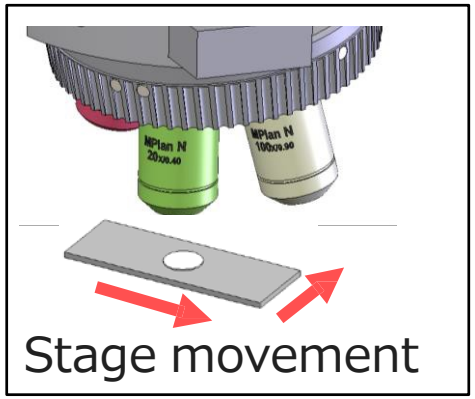
NRS-4500
- 532nm laser 100mW
- 900gr/mm
- BS
- Objective x100
- Standard detector iVac DR 324
- Imaging step : 1um
- Exposure : 25ms

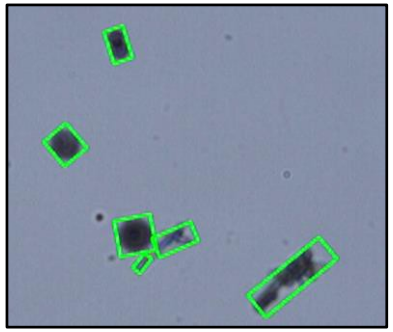
Search NAV – Sample Search Function

Upgrade the “Sample Search” Function.

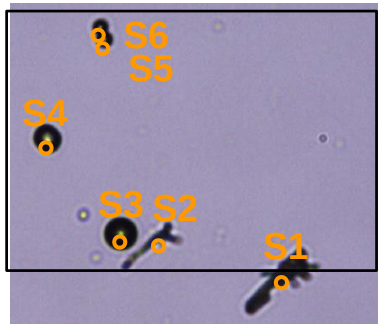
- Real time recognition of measurement candidate points, and registration of the measurement points by one click.
  - Upgrade the detection algorithm
    Search refinement is available (size, shape and contrast) 1 point measurement or imaging measurement

- Perform the measurement and qualitative analysis simultaneously, and the result of qualitative analysis is displayed.

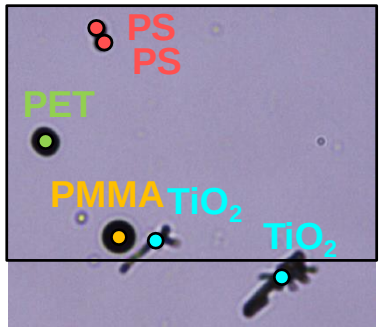




Real time recognition

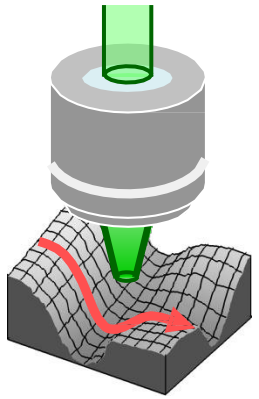


Automated registration with shape information of sample.



Measurement and a qualitative analysis are performed simultaneously.

Surface Scan Imaging - SSI

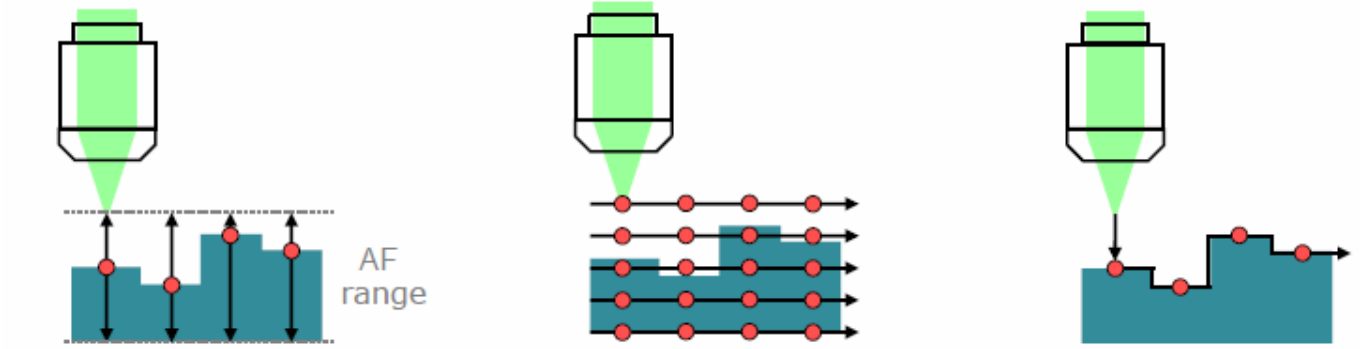


NRS-4500/5500/7500

- Scan the stage to XYZ based on All-in-focus image.
- Provide solutions for rough/inclined surface samples

Uneven (Rough) surface sample measurement

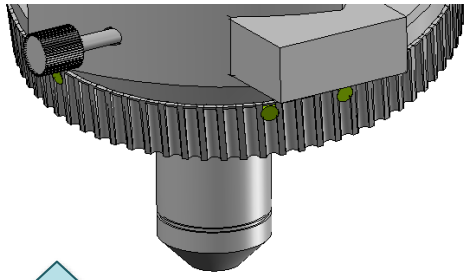
①AF at each point ②3D imaging ③ SSI

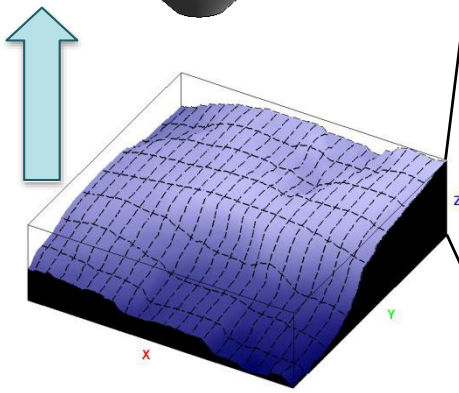


All-in-focus Image

Image shooting

▶Take pictures continuously moving Z stage



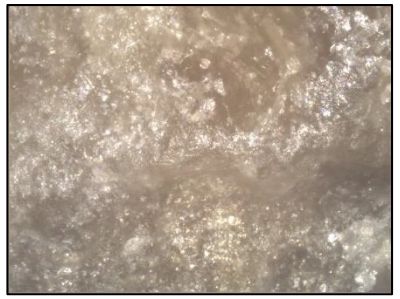


Composition

Depth composition

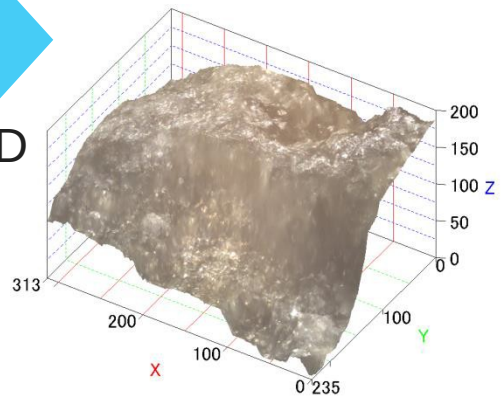
▶Compose All-in-focus image, focused on each points.

2 D



All-in-focus image

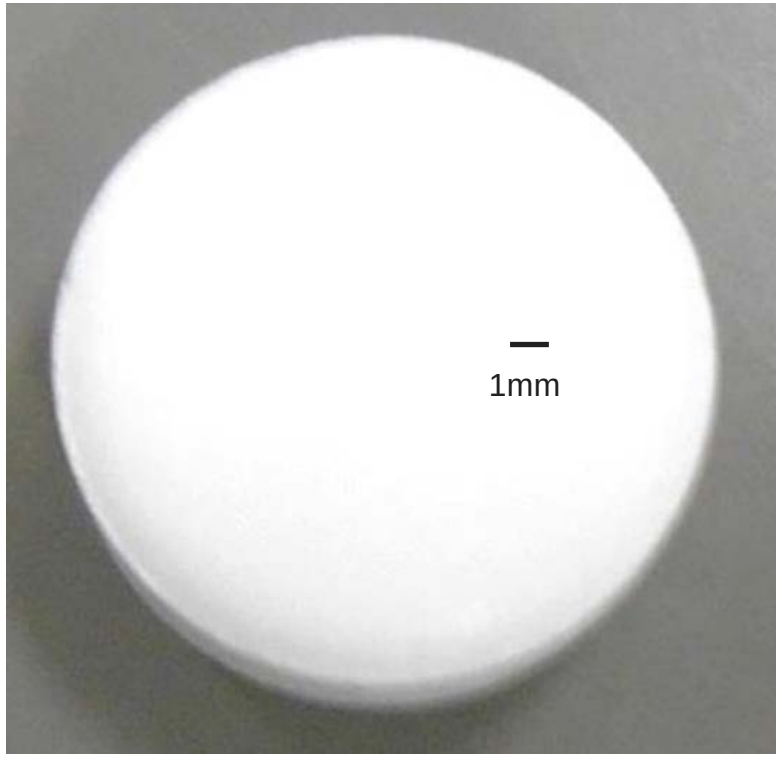
3 D



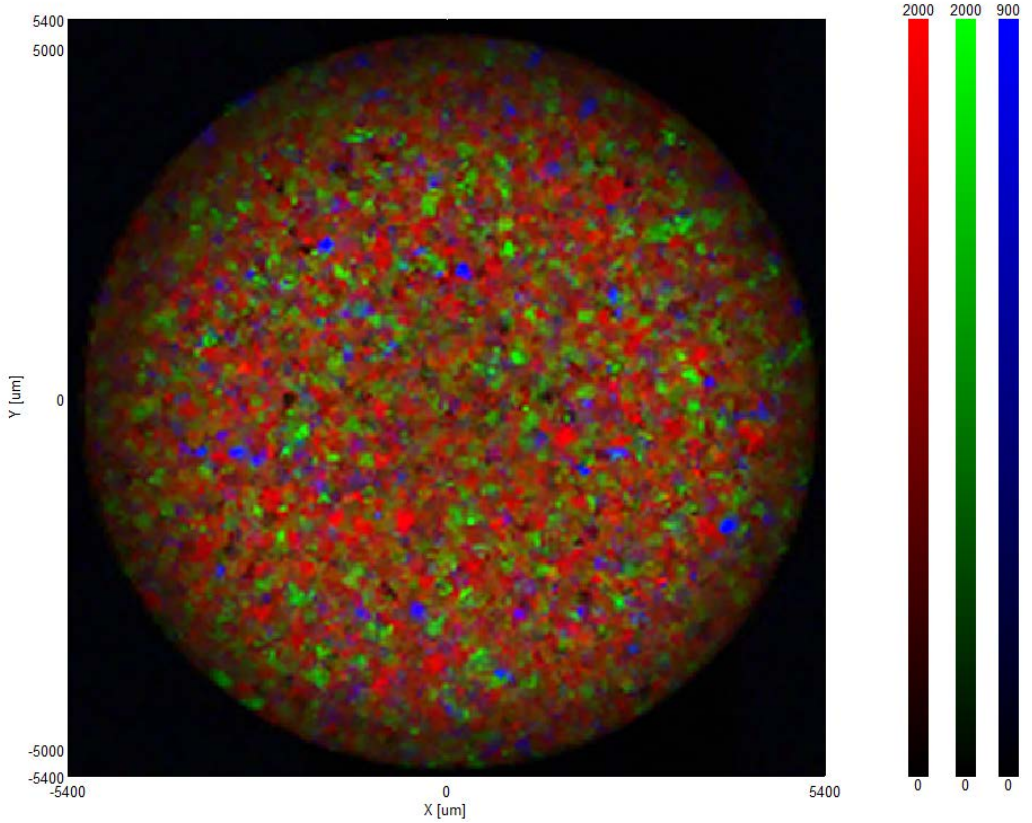
Surface shape information

Live Demo

Wide Area Imaging of Pharmaceutical Tablet



Visible Image



Distribution map of each component
（Etenzamide, Acetaminophen, Caffeine）

Ultra-high speed Image with excellent distribution map and spectra is achieved.

Summary

Quick **R**aman **I**maging (**QRI** - Fast Mapping)

- Automated stage is moving fast, short time in milliseconds can be used, EMCCD is used in EM mode increasing signal.
- Small and large maps

Advanced Search Function (micro particulate samples)

- Specially for particulate samples, automated measurement of a large number of samples, identification while measuring

Surface **S**canning **I**mage (**SSI –** Tilted or Uneven surfaces)

- All in focus, geological samples can be measured

JASCO Educational Resources

Past Webinars

https://jascoinc.com/learning-center/webinars/

E-books and/or Tips and Tricks Posters

- Raman
- Fluorescence
- FTIR
- CD

KnowledgeBase

ResearchGate

New COVID-19 Study: Stability evaluation of anti-Corona Virus VHH antibody using circular dichroism spectroscopy

NEXT WEBINAR WILL BE ON
Applications on Fluorescence Spectroscopy

Dr. Sherry Hemmingsen
TUESDAY June 30th AT 2:00 PM EDT