OPTOSKY Spectroscopy Solutions

Datasheet

AFM-Raman microscopy | ATRA8300

Features

- Combining the features of optics and AFM into a scientific research grade optical microscope.
- Automated AFM registration system adjustment.
- The laser detection head and sample scanning stage are integrated into one body, with stability and strong anti-interference ability.
- Ease-of-use. Fully automated operation. Measuring only takes a few minutes.
- High optical efficiency. Fast and sensitive analysis.
- Intelligent needle insertion method with motor-controlled pressurized electric ceramic automatic detection to protect the probe and sample.
- Ultra-high-power optical positioning system to achieve precise positioning of the probe and sample scanning area.
- Integrated scanner nonlinearity correction user editor for nanometer characterization and measurement accuracy better than 98%.
- A truly confocal capability with ultra-high spatial resolution. Generate high quality Raman images.
- Raman microscopes come equipped with binoculoars.
- Exceptional accuracy over the entire scan range.
- Powerful software. Acquire, analyse and display high quality Raman data.

Application

- Nanoparticles
- Life sciences, materials science, food science
- Biology, biotechnology, biomedical, biochemistry
- Forensic Medicine Identification
- Pharmaceuticals and cosmetics
- Archeology and arts
- Photovoltaics and semiconductors

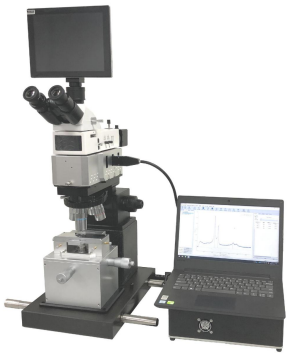
Description

This Raman instrument integrates an atomic force microscope (AFM), an optical microscope and a laser Raman spectrometer. AFM and Raman spectroscopy can be used respectively to characterize and analyze the surface morphology, particle size, roughness and Raman spectral performance of nanomaterials, thereby providing more comprehensive information on the sample and providing sharp microscopic images. Such integration allows users to improve work efficiency and spend more time on data collection and analysis, truly realizing in-situ detection and analysis of samples. The visual and precise positioning of the Raman detection platform allows observers to detect Raman signals of different surface states on the sample, and can simultaneously display the microdomain shape of the detected location on the computer.

Microscope objective is specially designed for the Raman system, which makes the laser spot close to the diffraction limit. It overcomes the problem that the focal plane for collecting Raman signals in ordinary Raman systems is slightly higher or slightly lower than the actual optimal focal plane, thus improving the quality of Raman spectra.

ATRA8300 has no optical path switching moving parts. All optical components are solid-state assembled and work very stably. It perfectly solves the loss of optical path for camera imaging and realizes the separation of camera imaging and Raman signal collection, thereby obtaining the best signal strength.

Model	Functional features
ATRA8300BS	Raman microscope +AFM all-in-one machine, basic type
ATRA8300AF	Auto focus
ATRA8300MP	Mapping type (highest configuration, auto focus, auto scan type)



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1.Ordering Information

Model	Functional features
ATRA8300BS	Basic type
ATRA8300AF	Auto focus
ATRA8300MP	Mapping type (auto focus, auto scan type)

Model	excitation wavelength*1/nm	Power/mW	Wavenumber range/cm^{-1}	Resolition*2/cm^{-1}
ATRA8300-532	532	100	200~3700	7-12
ATRA8300-633	633	50	200~3500	4-6
ATRA8300-785-27	785	600	250~2700	4-6
ATRA8300-785-35			200~3500	6-8
ATRA8300-785-43	785	600	200~4300	8-11
ATRA8300-1064	1064	600	200~2600	12-15
ATRA8300-1064	1064	600	200~3500	15-20

Note:
*1 Other wavelengths can be customized
*2 The spectrometer uses a narrow slit, which can effectively improve the resolution of the Raman spectrum, but will reduce the sensitivity of the instrument. Therefore, if you need a high-resolution instrument, please indicate it when placing an order. Optosky spectrometer is independently developed and produced, so customized production can be carried out to provide Raman spectrometers with various wave number ranges and resolutions. Due to limited space, we will not list them one by one here. If necessary, please consult our sales engineers.

Example: The actual final model code is: ATRA8300MP-785-35

2.Performance parameters

ATR3180 (Take 785nm excitation wavelength as an example)	
Raman spectroscopy properties	
Spetral range & spectral resolution	250~2700 @ 3-8 cm^{-1} 200~3500 @ 5-10 cm^{-1} 200~4300 @ 6-12 cm^{-1} Other wavelength ranges can be customized, down to 50 cm^{-1}
Spectral stability	σ/μ < 0.5% (COT 8 hours)
Temperature stability	Spectral shift ≤ 1 cm -1 (10~40 °C)
SNR	>6000:1
Detector	Semiconductor cooling 2048*64 pixel back-illuminated infrared enhanced CCD
Detection wavelength range	200nm~1100 nm
Pixel size	14 μm * 14 μm

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Detector dynamic range	13000:1
Laser center wavelength	785nm (±0.5nm)
Microscope camera system	3 or 5 megapixel industrial cameras
Focus method	Conjugate focus
Laser power	>550mW (software adjustable)
Laser spot diameter	>1μm
Laser stability	σ/μ <±0.2%
Laser linewidth	0.08 nm
Interface	USB 2.0
Atomic force microscope performance	
Operating mode	Contact mode, tap mode
Optional mode	Friction/lateral force, amplitude/phase, magnetic/electrostatic force
Force spectrum curve	F-Z force curve, RMS-Z curve
XY scan range	50×50um，20×20um and 100×100um optional
Z scan range	5um，2.5um and 10um optional
Scan resolution	Horizontal 0.2nm, vertical 0.05nm
Sample size	Φ≤68mm，H≤20mm
Optical objective lens	5X/10X/20X/50X plan apochromatic objective lens
Optical eyepieces	10X
Lighting method	LED Kohler illumination
Optical focus	BS: Coarse and fine manual focusing AF, MP: auto focus
Camera	5 megapixel CMOS sensor
Display	10.1-inch flat panel display with image measurement function
Scan rate	0.6Hz~30Hz
Scan angle	0~360°
X, Y axis electronically controlled two-dimensional platform	
Moving range	50×50 mm，100×100 mm optional
Moving resolution	0.1μm
Positioning accuracy	1μm
Z axis auto focus	
Focus accuracy	≤±0.2μm
Maximum stroke	20 mm
Focus speed	Less than 10 s

3.Operating software interface

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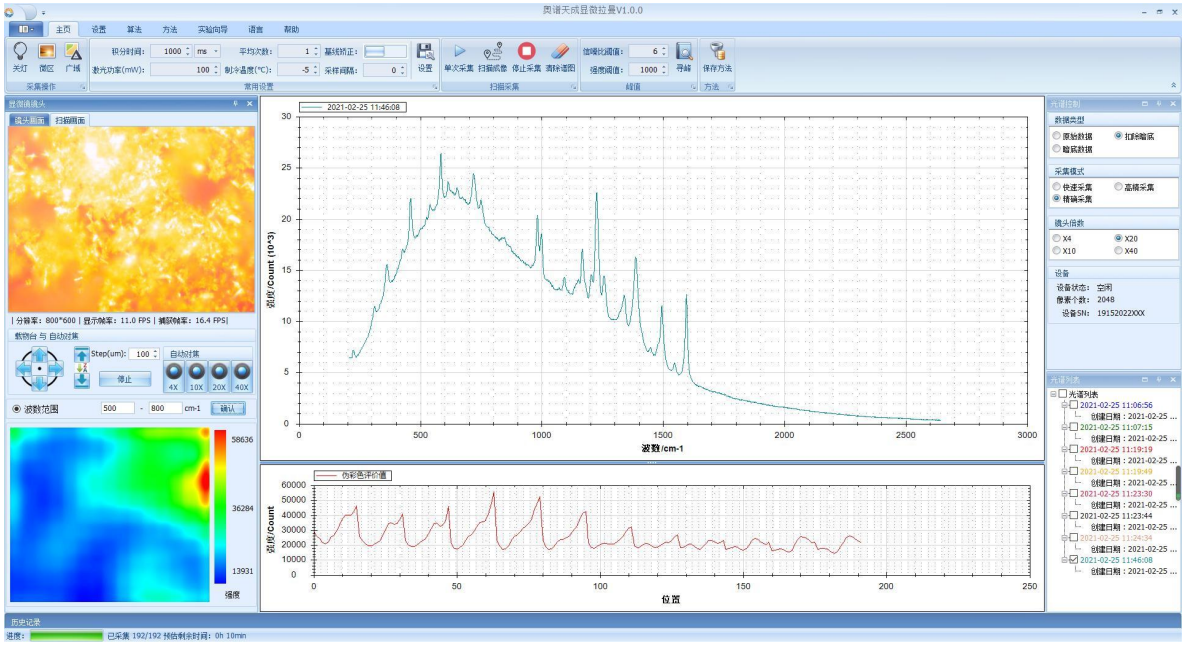

Figure 1 ATRA8300 software interface

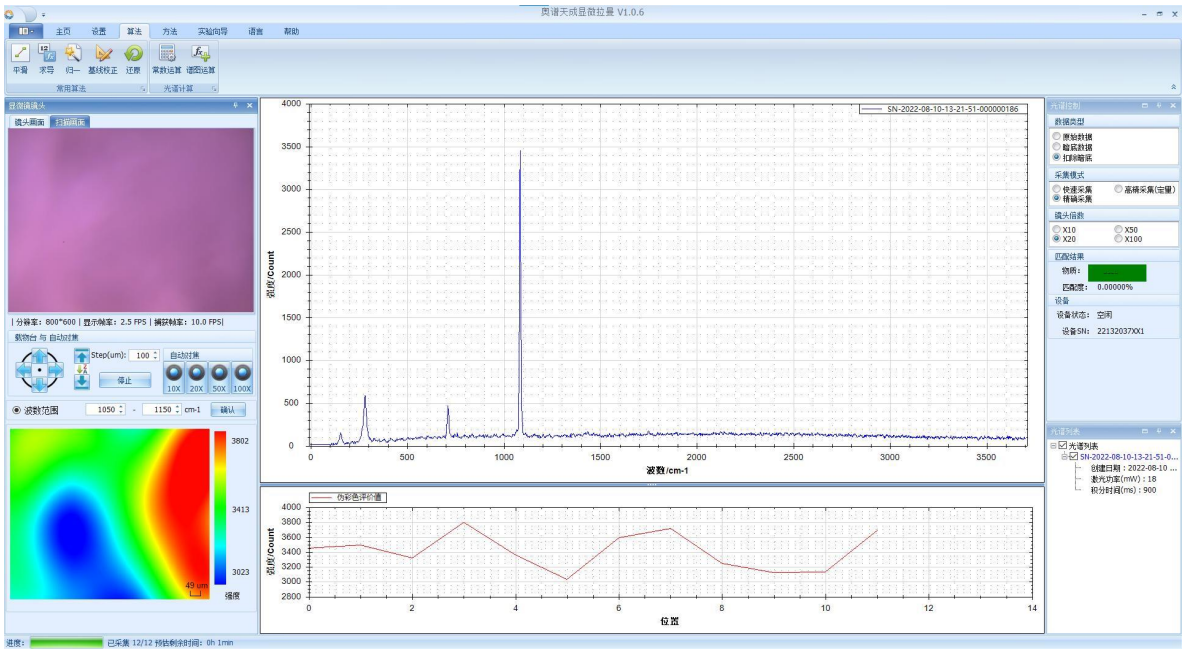

Figure 2 ATRA8300 software interface

4.ATRA8300 Physical map

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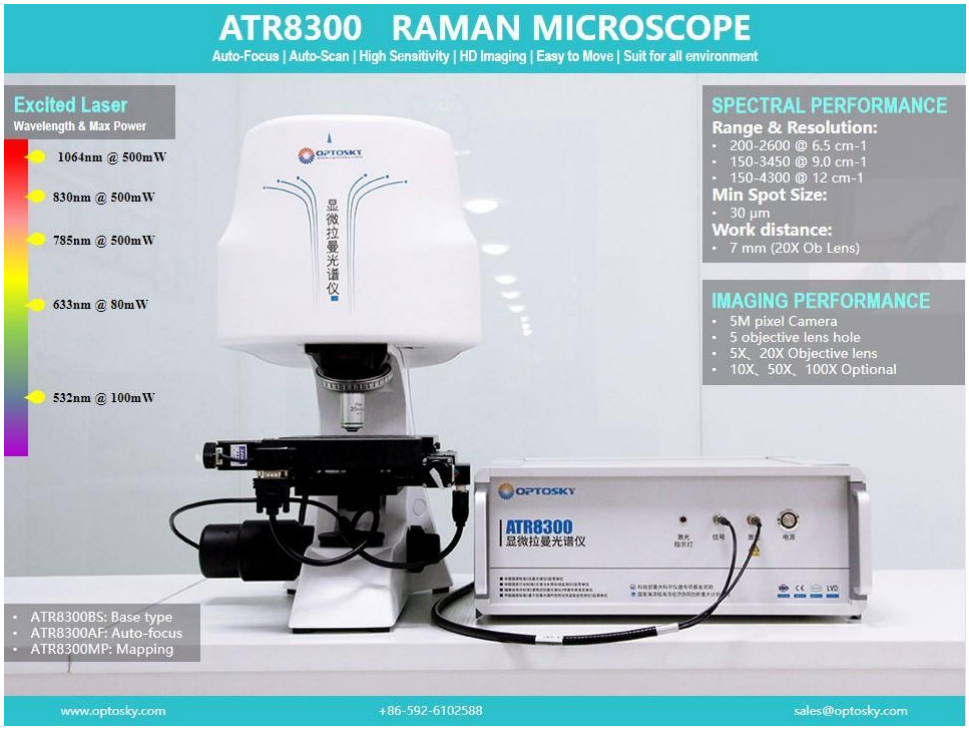

Figure 3 ATRA8300 Raman Microscope Overview

Figure 4 ATRA8300 physical map

5.Optical properties

5.1 Spectral performance

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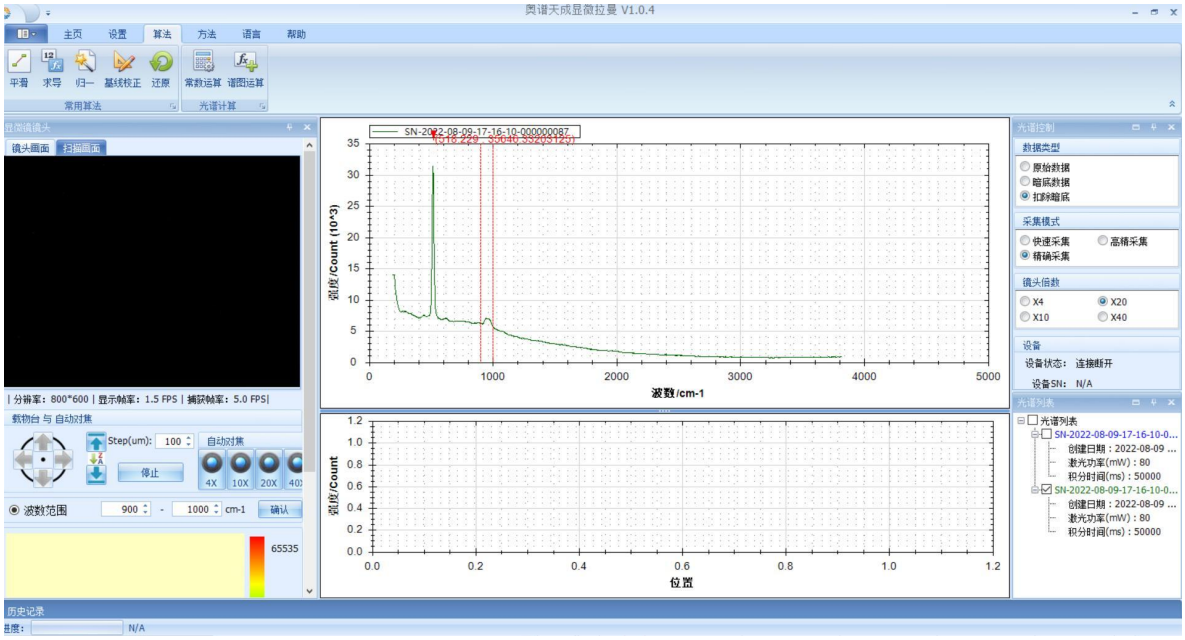

Figure 5 ATRA8300 tests the spectrum of single crystal silicon

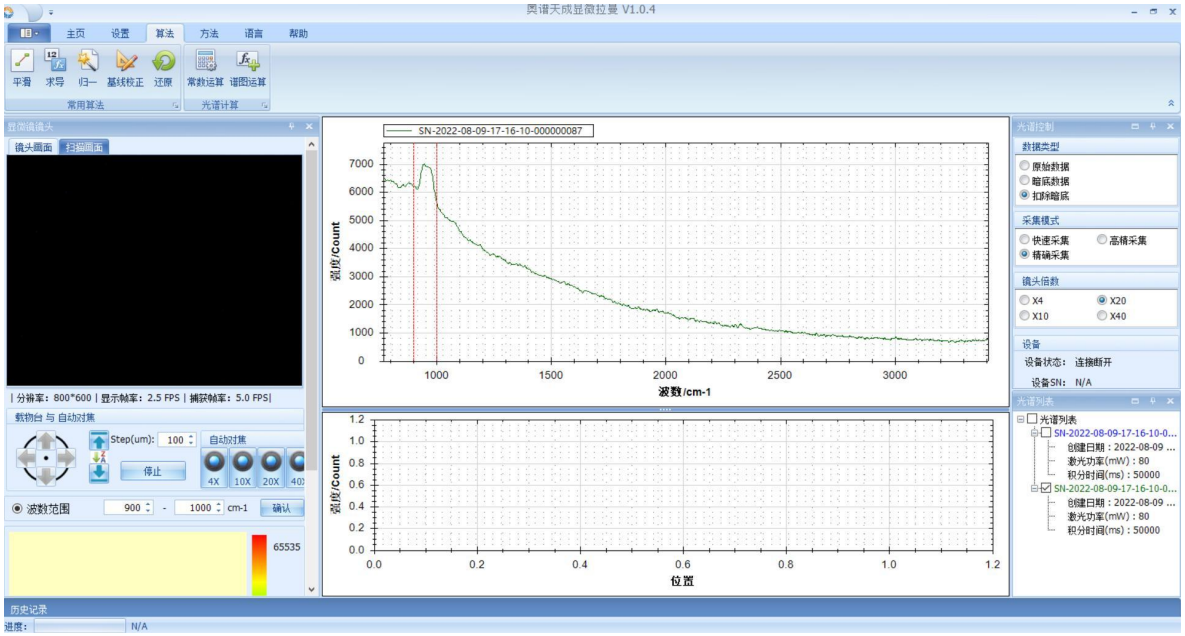

Figure 6 Partial enlargement of the second-order peak of the Raman spectrum of single crystal silicon tested by ATRA8300

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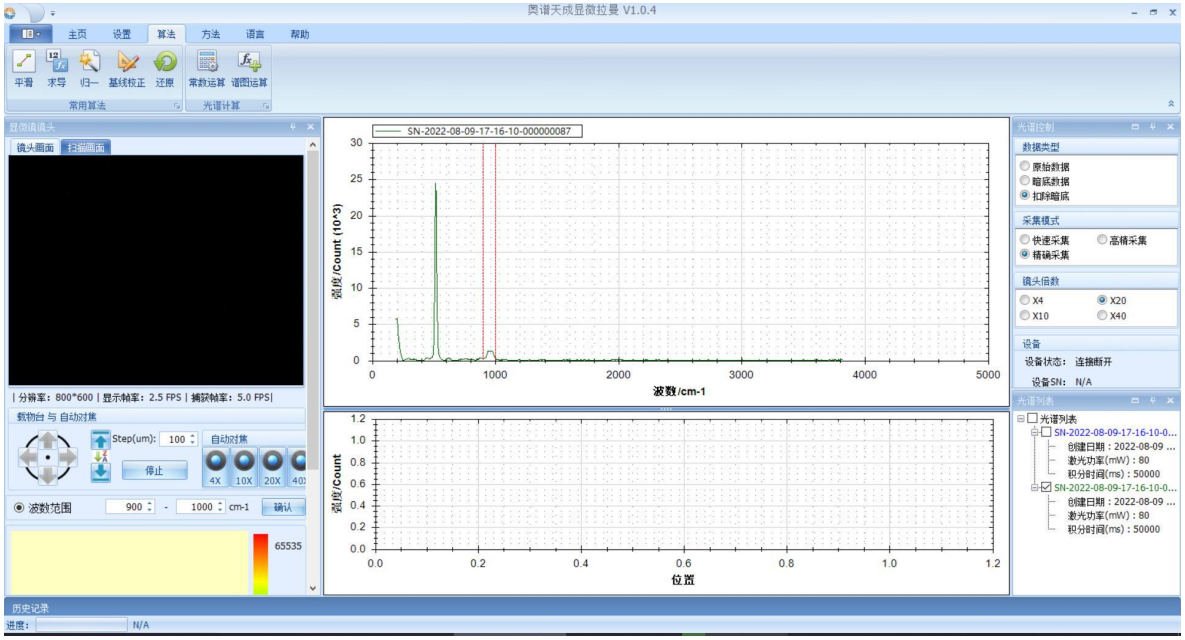

Figure 7 ATRA8300 tests the spectrum of single crystal silicon (after baseline correction)

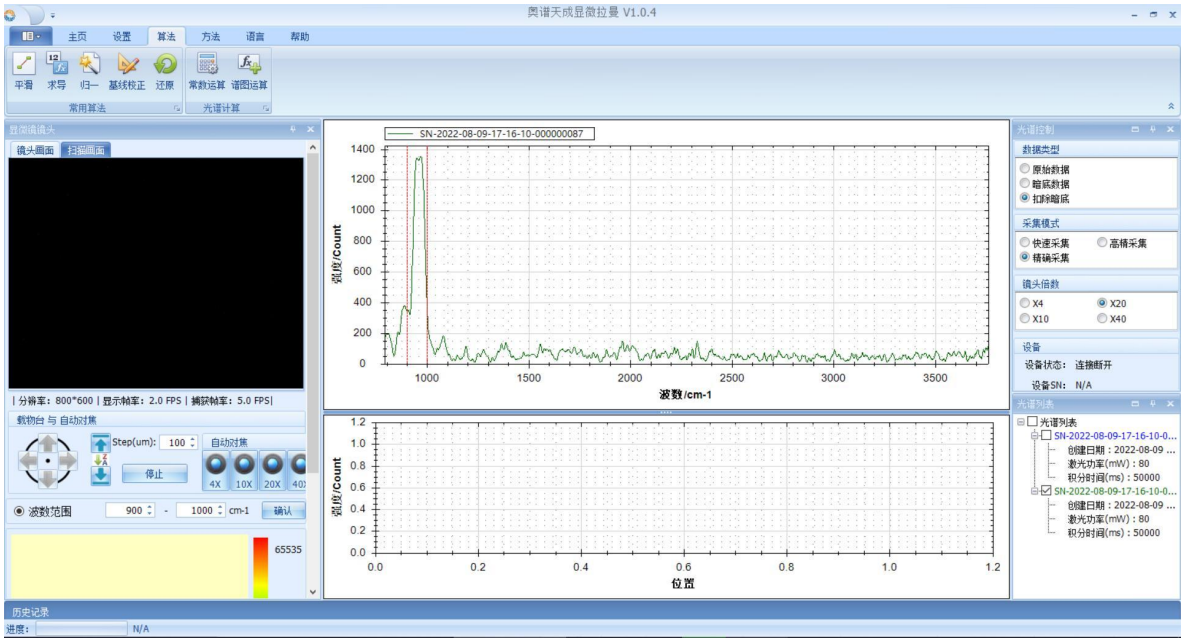

Figure 8 Partial enlargement of the second-order peak of the Raman spectrum of single crystal silicon tested by ATRA8300

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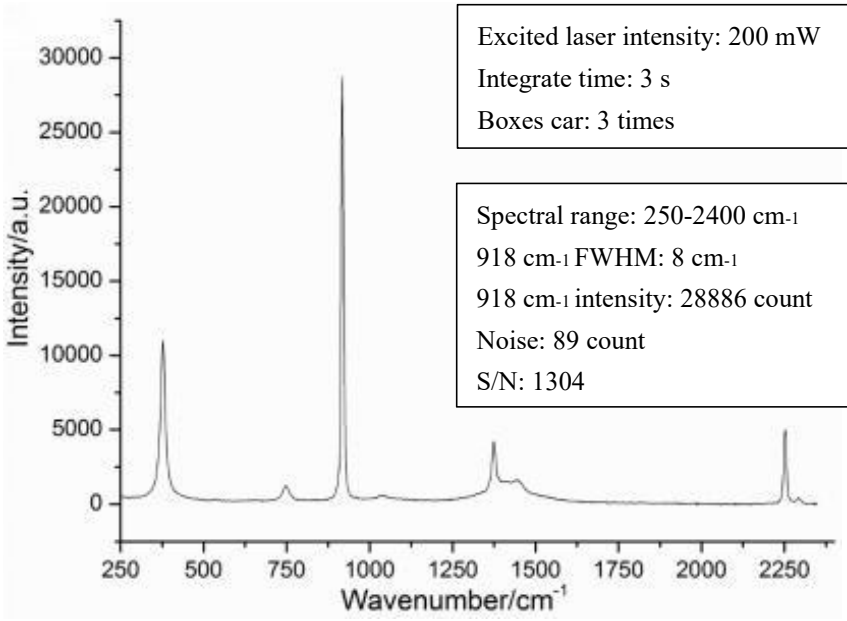

Figure 9 Acetonitrile Raman spectrometer collected by ATRA8300-785

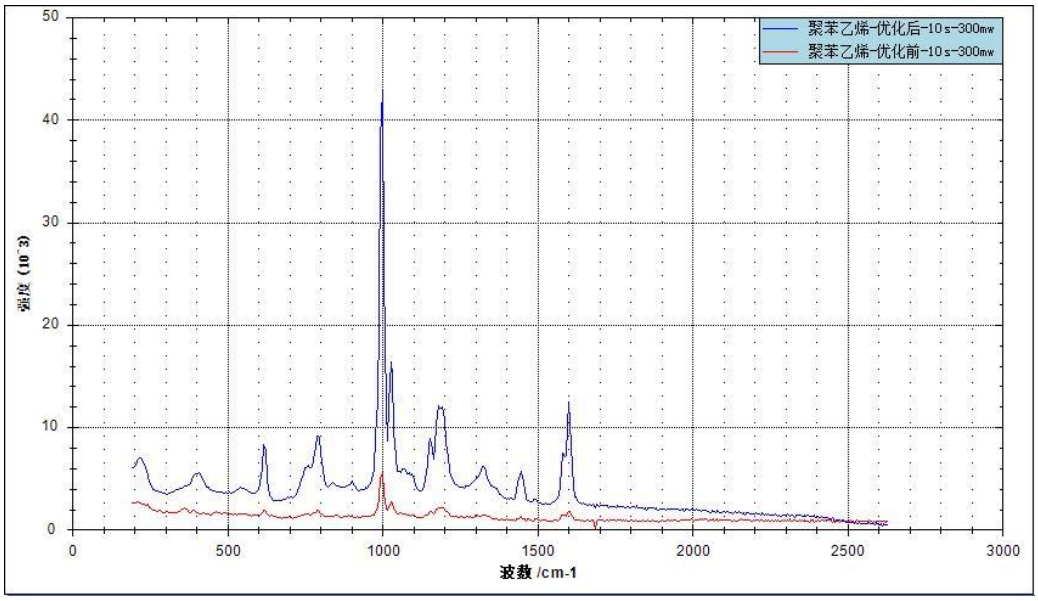

Figure 10 The optical path of ATRA8300-1064 has been extremely optimized. The optimized optical path efficiency has been increased by 8 times, and the signal-to-noise ratio has been increased by 8 times.

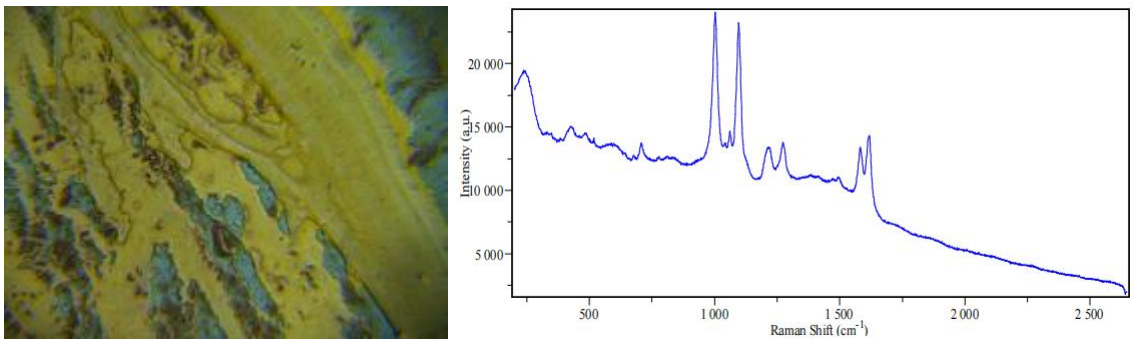

Figure 11 Sers experiment 1 performed by ATRA8300 (the left picture is the sample picture, the right picture

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is the Sers Raman spectrum)

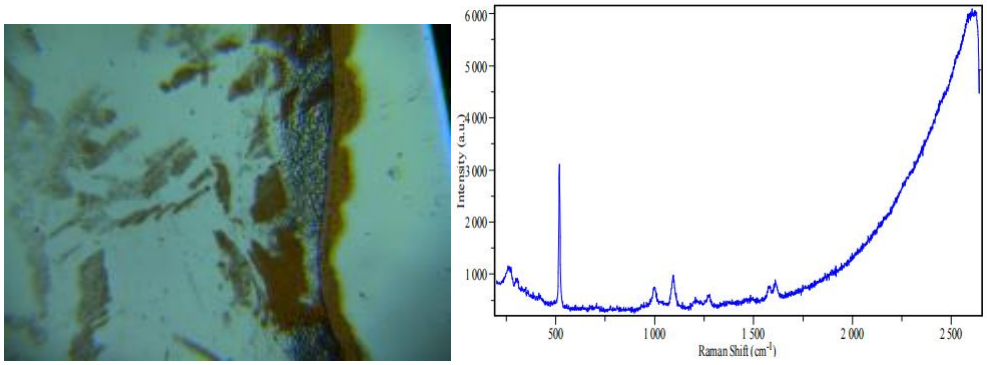

Figure 12 Sers experiment 2 performed by ATRA8300 (the left picture is the sample picture, the right picture is the Sers Raman spectrum)

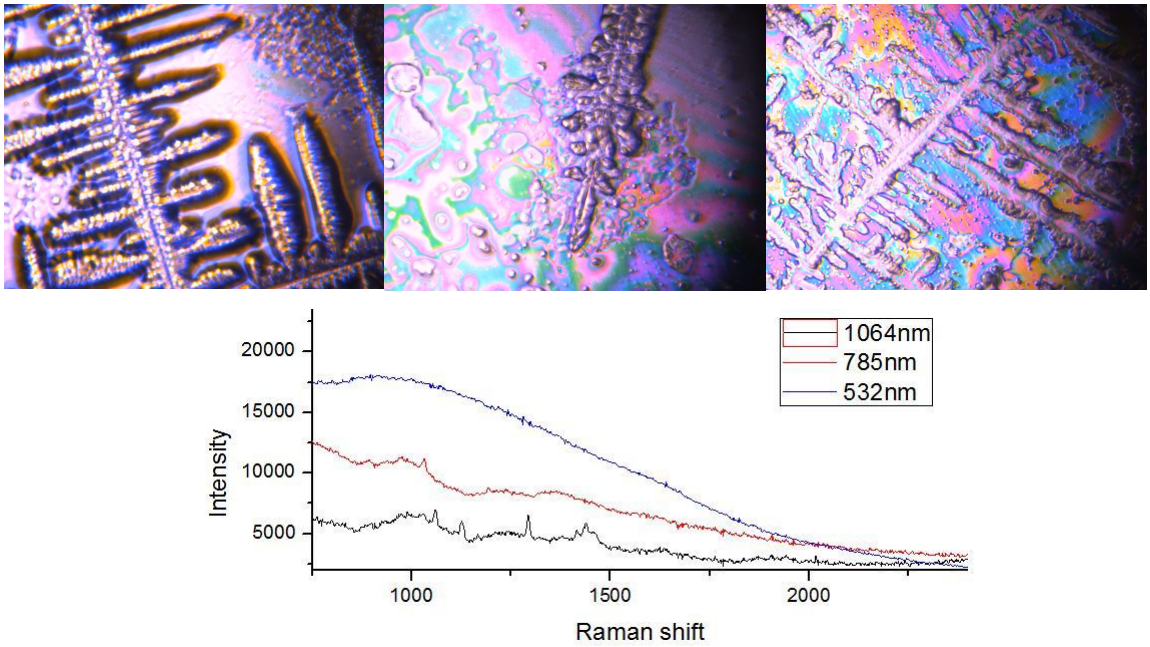

Figure 13 ATRA8300 is used to test cell metabolites. The top three pictures are surface morphology pictures, and the bottom is its Raman spectrum. They were tested with ATRA8300-1064, ATRA8300-785, and ATRA8300-532 respectively.

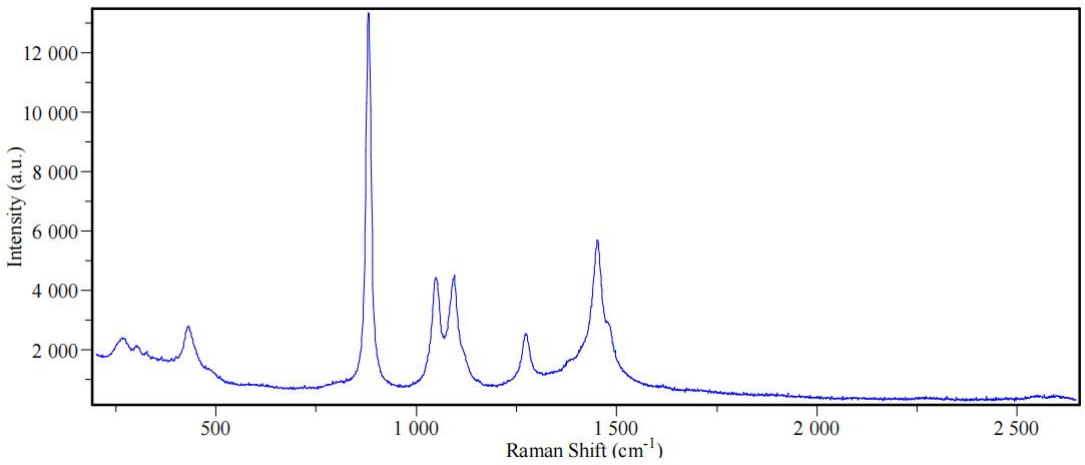

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Figure 14 ATRA8300 tests the Raman spectrum of alcohol (500mW, 1S integration time)

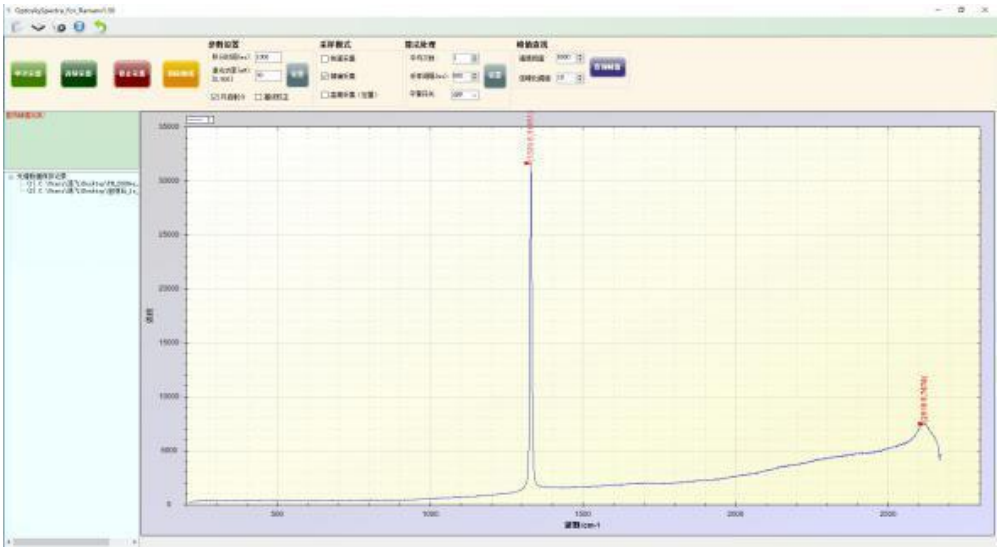

Figure 15 ATRA8300 tests the Raman spectrum of diamond (30mW, 1S integration time)

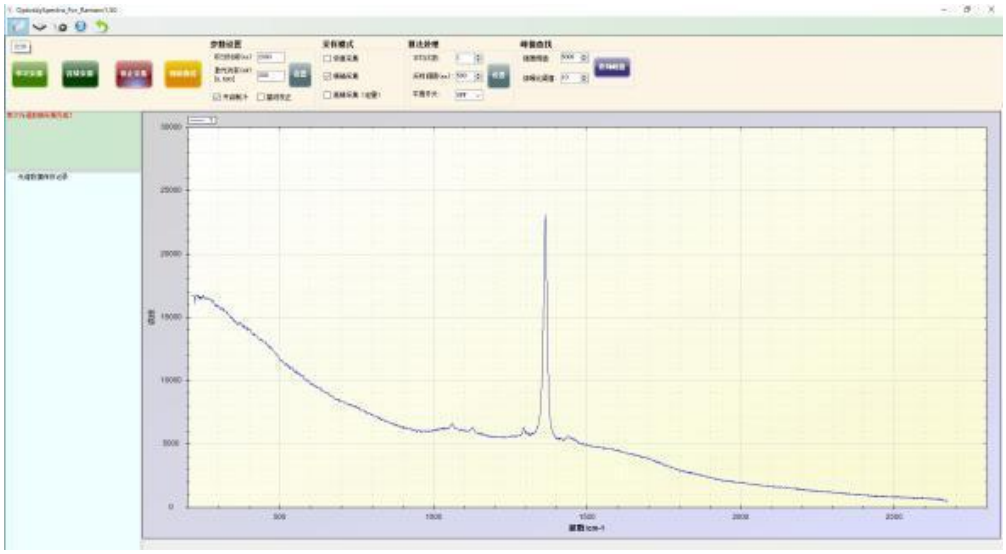

Figure 16 ATRA8300 tests the Raman spectrum of boron carbide (PN) (200mW, 2S integration time)

5.2 Spectral resolution

5.2.1 Raman spectrum of Tylenol

Excited laser intensity: 200 mW Integrate time: 10 s	Raman spectra of Tylenol showed the resolution condition in the long wavelength region.

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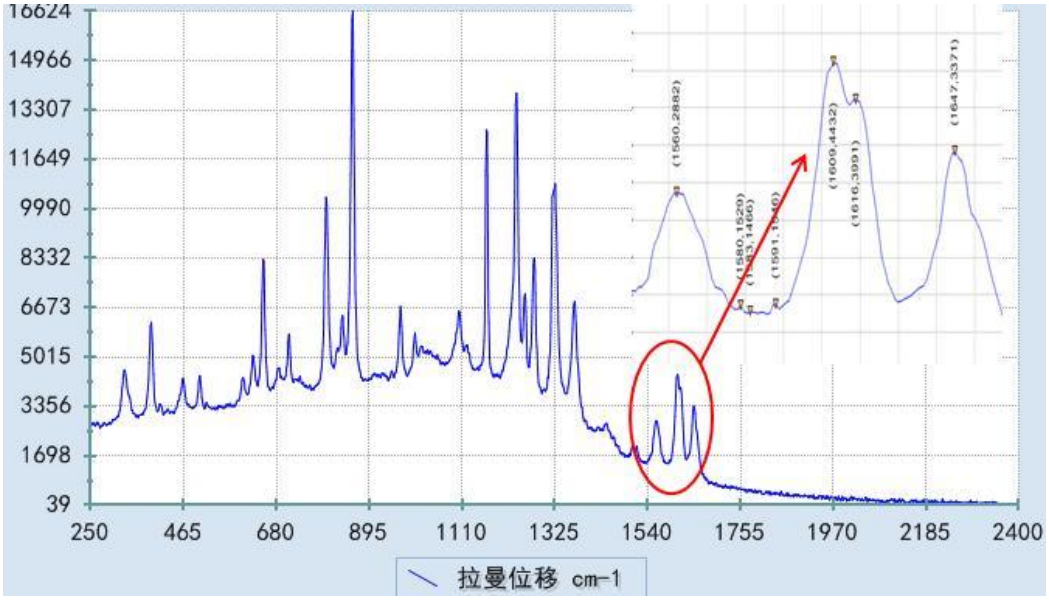

Figure 17 Raman spectrum of Tylenol. The Raman vibration peak at 1610/1615 cm-1 can be clearly distinguished in the figure.

5.2.2 Raman spectrum of gasoline

Excited laser intensity: 200mW Integrate time: 10 s Boxes car: 1 time	Raman spectra of petrol 93# showed the resolution condition in the short wavelength region.

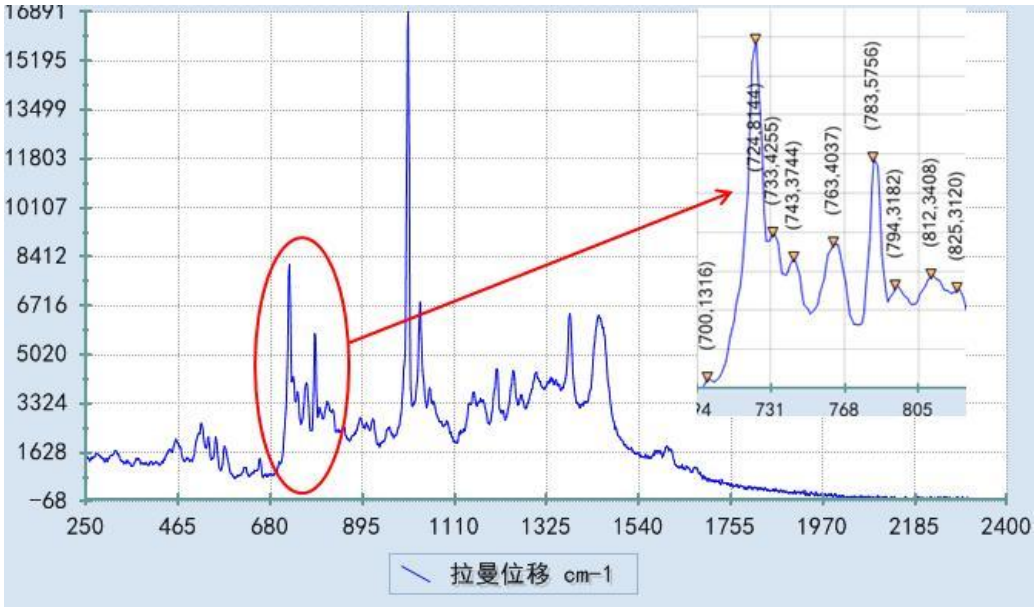

Figure 18 Raman spectrum of 93# gasoline. 723/732/742cm^{-1} Raman shift can be clearly distinguished.

6.Stability

Figure 3.1 and Figure 3.2 are the temperature stability test of ATRA8300, which is stable from 5-40℃. At each temperature node, the spectrometer remains stable for more than 1

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hour. The test sample is acetonitrile, the wave number drift is less than or equal to 1cm-1 (Figure 3.1), and the peak intensity change is less than 10% (Figure 3.2).

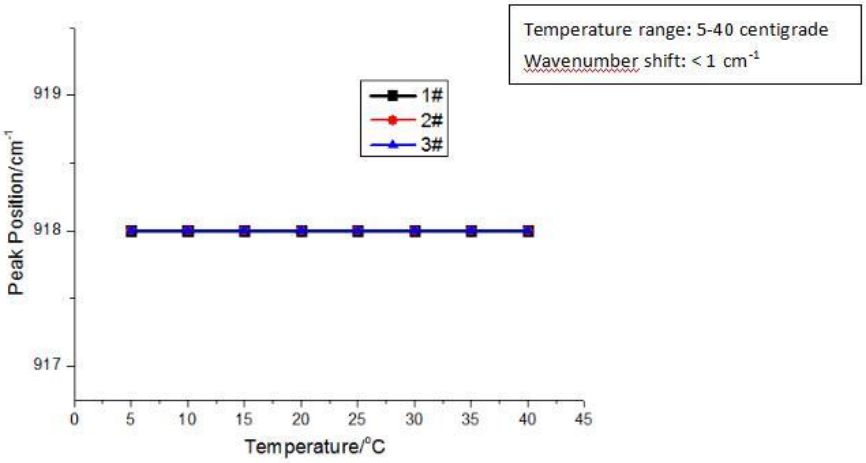

Fig. 3.1 Wavenumber shift results testing from 5 °C to 40 °C of fives ATR2000 portable Raman spectrometers

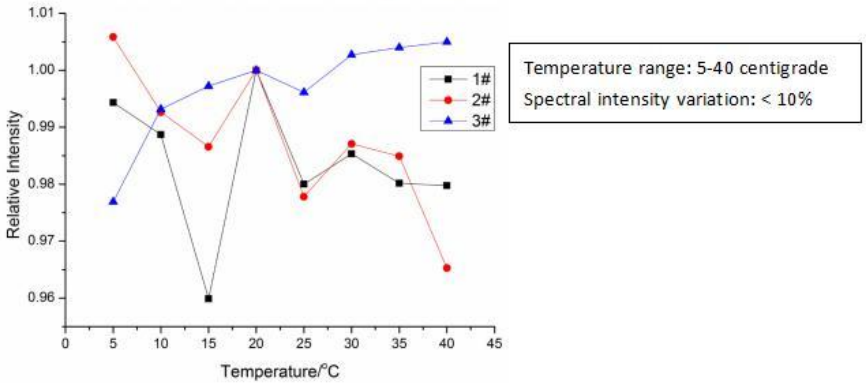

Fig. 3.2 Intensity variation testing from 5 °C to 40 °C of fives ATR2000 portable Raman spectrometers

7.Instrument details

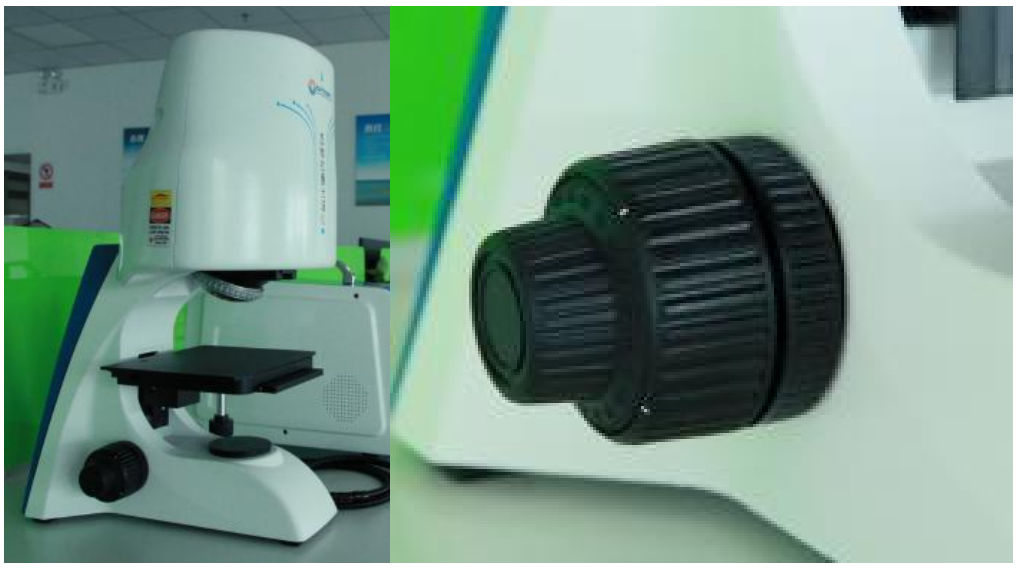

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Figure 19 Imported high-stability microscope stand. X, Y, Z three-dimensional high-precision adjustment. The adjustment knob has suitable damping and a smooth adjustment feel. Weigh up to 5.6 Kg. It is not easily knocked over, and is very stable.

Figure 20 High transmittance objective for Raman signals. Objective focal length up to 8 mm.

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