



future's
in the making

IROS

FTIR Spectroscopy





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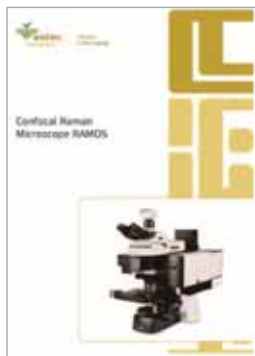
Our mission is to be a company that finds, protects and develops cutting-edge ideas to create new products for technology progress. That is why the symbol of our company is a growing sprout.

Ostec select the best innovative technologies and instruments, modify by corporate engineering and provide complete solutions on international market by Ostec Company Group.

We offer to our clients: the most suitable equipment to meet customer's requirements, deep knowledge of customer's applications, qualified and reliable maintenance support.



Our other products:



RAMOS
Confocal Raman
Microscopes



OCOS
optical components



NIOS
Nanomechanical
Testers



FiPOS ATR
fiber probes



IROS P series
Industrial FTIR
Spectrometers



AVOS
vibration control
solutions



SEOS 02
optical emission
spectrometer



Accessories for
Scanning Probe
Microscopy



LIOS 500N
laser elemental
analyzer



OMOS M series
Analytical
Metallographic
Systems

Ostec offers instruments with unmatched performance

- Leading positions in FTIR instrumentation market in Russia under SIMEX brand for 25 years
- The best price-performance ratio
- Wide range of own-produced accessories
- Great experience in non-standard and customized systems design to meet customer's requirements
- Collaborative developments with leading research institutes
- Own unique development and production of spectrometer components

Key application fields

- Product quality control laboratories
- Manufacturing quality control laboratories
- Scientific research institutes
- Academic institutes and universities
- Chemical and petrochemical plants
- Gemological laboratories
- Forensic laboratories
- Environmental control laboratories
- Agricultural laboratories

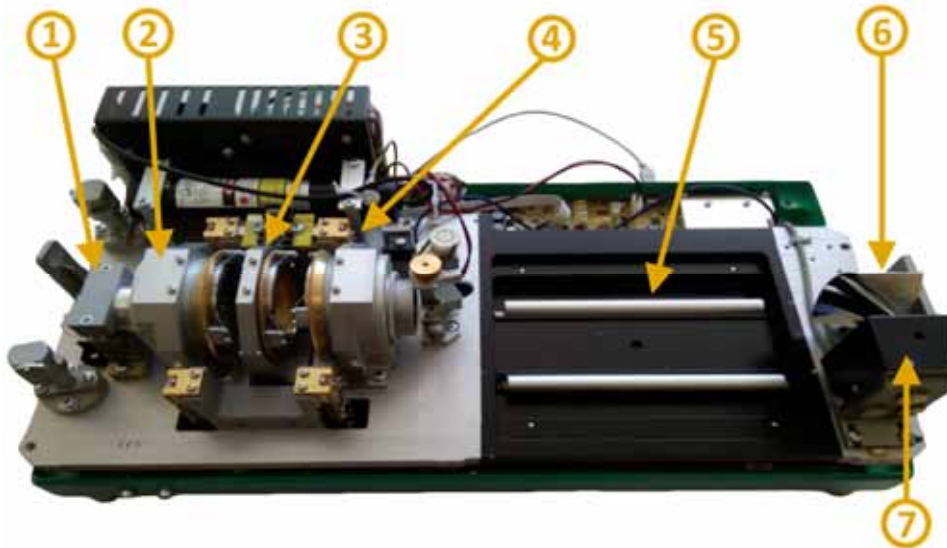
Unique Double Cat's Eye interferometer is a base of **IROS** FTIR spectrometers. The original design of interferometer was developed and patented in 1993 by Dr. Tatyana Yezhevskaya.

Double Cat's Eye interferometer advantages over classical Michelson design

- Resistance to misalignment, thermal and vibrations drifts. **No additional adjustment** is required **over the life cycle** of the spectrometer
- High beam splitter resolution
- Angle of incidence for beam splitter is 90°. It allows to **avoid polarization effects**. Angle of incidence for Michelson interferometers is 45° or 30°

Construction of FTIR spectrometer based on Double Cat's Eye interferometer

Interferometer construction reliability and small size allows to use spectrometer as a mobile analytical station.



1. IR radiation source
2. Input optical focusing system
3. Interferometer
4. Parallel beam converting mirrors
5. Cuvette compartment
6. Parabolic mirror
7. Photodetector

IROS spectrometers can be equipped with thin film MG-32M detector with low temperature inertia and better thermal stabilization than standard DLaTGS. The detector was developed based on technologies used in the Russian space industry.



IROS 05 Multipurpose FTIR Spectrometer

IROS 05 FTIR spectrometer is designed to provide the wide range of sample measurement techniques in the most challenging environments, from the scientific laboratory to the industrial production line. Compact size, reasonable price, unique set of accessories and high performance – these advantages of **IROS 05** spectrometer allow it to fit the most of research and field tasks as a mid-level spectrometer for academic and industrial applications.



Features

- Wide array of functions due to various attached modules and detectors
- Capability of additional external devices connection for IR spectrum registration
- Stability to temperature fluctuation and vibration due to unique patented interferometer design
- Humidity resistance because of ZnSe optics
- Spectrum recording control buttons on device case for fast routine operations
- Compact and light-weight

Main advantages

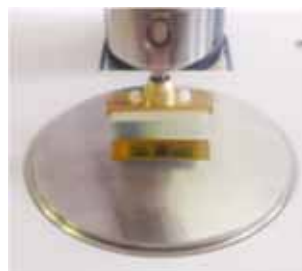
- Unique **misalignment-free**, humidity and temperature change resistant Double Cat's Eye interferometer
- **Integrated Transmission, Specular-Diffuse** and **ATR** modules (**Diamond, ZnSe** or **Ge**) in basic configuration
- **HATR (ZnSe or Ge)** instead of **ATR** module
- Measurement with controlled heating up to **200 °C** with Diamond ATR
- Interface for **IR M2/M3 microscope** with specular reflection and micro-ATR (Ge) modes with mapping
- Ports for external devices, such as multi-pass gas cell or IR telescope
- Up to **two ATR fiber probes** connected simultaneously
- Possibility of **two detectors simultaneous** mount, such as *MG-32M, DLaTGS, Si, InGaAs, MCT LN₂, MCT TE cooling, LiTaO₃*
- Expansion to **NIR** spectral range with second external light source



*Sample holder
with diamond prism*



*Sample holder
with ZnSe prism*



HATR



*Specular-diffuse
reflection flange*

Specification

Spectral range	5 700 – 470 cm ⁻¹ with MG-32M detector; 8 500 – 470 cm ⁻¹ with DLaTGS detector; 6 000 – 600 cm ⁻¹ with MCT detector
Beam splitter	ZnSe
Interferometer	Double Cat's Eye
Detector	MG-32M, DLaTGS, MCT
Spectral resolution	0.5 cm ⁻¹
Signal-to-noise ratio with pyroelectric detector	≥ 40 000 RMS (range 2 200 – 2 000 cm ⁻¹ , per 1 min, resolution 4 cm ⁻¹)
Weight	15 kg
Dimensions of main unit	34 × 20 × 38 cm



IROS 05 combined with wide-range IR microscope IR M series



The combination of **IROS 05** and IR wide-range microscope **IR M2/M3** allows to study samples with size from 5 microns, including those with inhomogeneous composition. It is possible to observe the investigated object with magnification over 200X both in binoculars and on the monitor with a digital video camera. Diaphragms allow selecting a local area of arbitrary shape, as well as scanning the sample surface, recording the spectrum in real time.

Features

- Simultaneous spectrum registration and sample observation with built-in video camera
- Specular reflection and micro ATR modes with mapping
- IR spectra registration without sample preparation
- Minimal linear sample size 5 – 10 μm

IROS 05 with ATR probes

An important feature of **IROS 05** is a possibility to connect fiber optic probes via SMA port (adapter) to perform sampling-free measurements and chemical reaction monitoring in-situ in real time.

Top quality fiber optic immersion probes are suitable for laboratory use as well as for industrial reactors. Use of probes ensures an accurate monitoring of the reaction and analysis of chemical processes to increase the yield and reduce the costs.

Fiber optic ATR probes can be equipped with various sensitive tips:

- Diamond
- Si
- ZnSe
- ZrO₂



Features

- Unique efficiency in near and mid-infrared spectrum
- ATR probe tips without dead zones
- Extraordinary reliability for industrial applications in harsh environments up to 250 °C and pressure 200 Bar

IROS 05i FTIR Spectrometer for Industrial Process Control

IROS 05i is a special FTIR spectrometer designed for work in harsh conditions. This model allows to solve a wide range of industrial problems, including process control, with the possibility of on-line (in-situ) monitoring of industrial processes (in reactors or pipelines) both for laboratories and industry facilities.

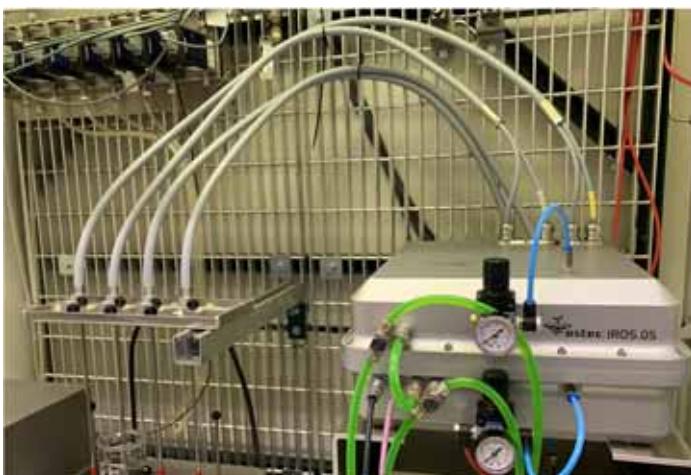
Features

- Completely tight metal case
- Ports for connecting an external cooler and purging with inert gases to protect and stabilize the optical unit in difficult environmental conditions
- Module for connecting fiber optic probes (up to two simultaneously)



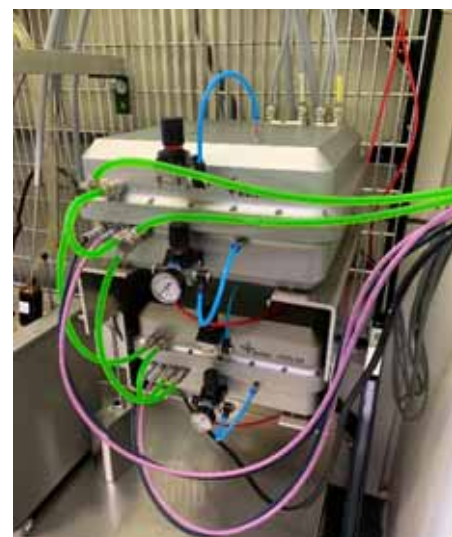
Main Advantages

- The ability to connect **two probes**, allows to work with the device in two-channel mode, monitoring simultaneously the processes taking place in two different reaction environments
- The control software allows you to set **flexible routines** with continuous analysis and evaluation of the data obtained in real time
- A **wide range of probes** designed for use in corrosive environments, at high pressures and temperatures, among others
- The ability to install a **high-sensitivity MCT detector with thermoelectric cooling** will allow the device to be used where there is no possibility to use liquid nitrogen for cooling



Specification

Spectral range	5 700 – 470 cm^{-1} with ZnSe beam splitter and pyroelectric detector; 7 900 – 350 cm^{-1} with KBr beam splitter, photodetector window, and pyroelectric detector; 8 500 – 470 cm^{-1} with DLaTGS detector; 6 000 – 600 cm^{-1} with MCT detector
Beam splitter	ZnSe, Diamond, KBr
Interferometer	Double Cat's Eye
Detector	MG-32M, DLaTGS, Si, InGaAs, MCT LN ₂ or TE cooling, LiTaO ₃
Light source	SiC
Spectral resolution	0.4 cm^{-1}
Signal-to-noise ratio	$\geq 50\,000$ KBYI (range 2 200 – 2 000 cm^{-1} , per 1 min, resolution 4 cm^{-1})
Integrated ATR	Optional
Sealed housing	YES
SMA connectors for connecting fiber optic probes	YES
Weight	25 kg
Dimensions of main unit	410 × 200 × 410 mm



IROS 03 Extendable FTIR Spectrometer

IROS 03 Fourier infrared spectrometer is designed to record absorption spectra of solid, liquid and gaseous substances in the near and medium IR region (including drugs, varnishes and paints, oil products, pharmaceuticals, polymer films and fibers) with their subsequent identification, as well as for qualitative and quantitative analysis of mixtures containing several components.



Main Advantages

- Unique **misalignment-free**, humidity and temperature change resistant Double Cat's Eye interferometer
- **Sealed drainable** optical unit
- The ability to expand the spectral range using additional radiation sources, detectors and beam splitters
- Three ports for connecting external devices
- Great variety of extension modules



Specification

Spectral range	5 700 – 470 cm ⁻¹ with ZnSe beam splitter; 8 500 – 470 cm ⁻¹ with DLaTGS; 7 900 – 350 cm ⁻¹ with KBr beam splitter and photodetector window
Beam splitter	ZnSe, Diamond, KBr
Interferometer	Double Cat's Eye
Detector	MG-32M, DLaTGS, MCT
Light source	SiC
Spectral resolution	0,4 cm ⁻¹
Signal-to-noise ratio	≥ 50 000 RMS (range 2 200 – 2 000 cm ⁻¹ , per 1 min, resolution 4 cm ⁻¹)
Connection of IR Microscopes	IR M2/M3
Sealed housing	YES
Control electronics	USB interface and self-test device
External optical output	YES
Extension modules	Multi-purpose ATR/SDR module, specular and diffuse reflection module with 45°/15° beam angle, focusing module with adjustable stage, multiple ATR module, cell with temperature controller, focusing module with liquid cell, focusing module with parabolic optics, cooled MCT detector
Weight	18 kg
Dimensions of main unit	630 × 305 × 210 mm

IROS 03 Extension Modules

IROS 03 FTIR Spectrometer can be equipped with large number of extension modules. It makes possible to use **IROS 03** for different common and specific applications.



Multi-purpose ATR/SDR module



Specular and diffuse reflection module with 45° beam angle



Focusing module with adjustable stage



Multiple ATR module



Specular reflection module with 45° beam angle



Cell with temperature controller



Focusing module with liquid cell



Focusing module with parabolic optics



Specular and diffuse reflection module with 15° beam angle

and others...

AT01MP – multi-purpose ATR/SDR attached module with a diamond prism and integrated visualization system



Main advantages

- Preliminary sample preparation is not needed for most cases
- Built-in video camera allows to register spectrum and observe sample (with video capturing) simultaneously
- Spectra registration both in ATR mode and in specular/diffuse reflection mode
- Diamond, ZnSe and Ge prisms. Quick ATR prism replacing by operator
- Quick operating mode changing
- Sample types: liquids of any viscosity grade (solutions, suspensions, oils), powders, polymer films, fibers, solid and elastic samples up to 0.25 mm² (paint and varnish coatings fragments, polymer particles)

AT03MP – multi-purpose diamond cell with temperature controller

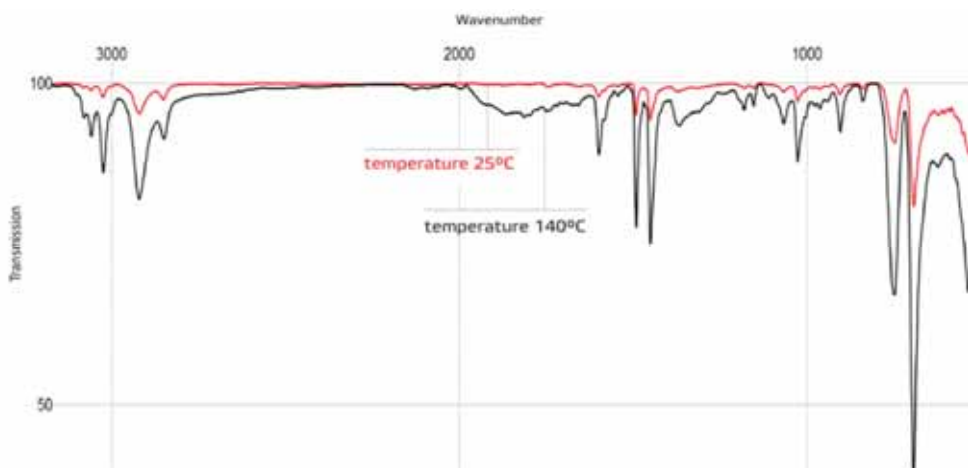
Sample heating system with ATR attached module. Diamond crystal allows to register IR spectra of chemically aggressive compounds, acids, alkalis and hard, abrasive materials.

Main characteristics

- Max. controlled sample temperature: 220 °C
- Temperature adjustment accuracy: 1 °C
- Time to peak temperature: ≤15 min (usually 10 min)

Application

- Polymer compounds thermal stability study
- Polymers curing kinetics investigation



Spectra of polymer at room temperature (red) and at 140 °C (black)

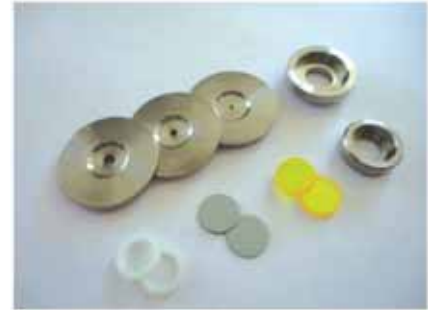
Heated solid samples spectra are defined more accurately than the cold ones. Solid sample heating helps to increase method sensitivity.

AT02F – focusing attached module with adjustable stage and horizontal sample installation



Main advantages

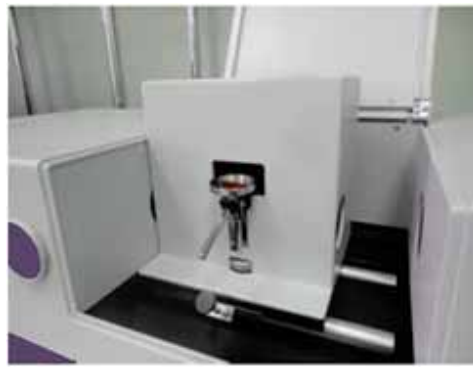
- Horizontal sample installation
- Simple sample preparation
- Arbitrary form of samples
- Condenser optics
- Min. sample diameter: 1 mm
- Liquid samples



Sample types

- KBr tablets of any powdered samples (pharmacological preparations, fragments of paint coatings etc.)
- Liquid and pasty of samples on KBr, ZnSe or Si windows
- Solid samples with arbitrary shape (precious stones, optical parts, semiconductor materials)
- Polymer films (polyethylene, PET, polycarbonate, acrylates, etc.) including precipitated from solutions

AT01PZ – specular reflection attached module with 45° beam angle of incidence, lower sample installation, and integrated imaging system



Main advantages

- Sample horizontal installation
- Built-in visualization system
- Simple sample preparation
- Arbitrary form of samples
- Condenser optics
- Sample dimensions from 2 to 30 mm
- Liquid samples analysis

Sample types

- Powders and granules
- Liquid and pasty samples
- Solid samples with arbitrary shape (gemstones, optical parts, semiconductor materials)
- Polymer films and solid polymers



Main characteristics

- Input light transmission (in operating spectral range) $\geq 40\%$
- IR focusing spot diameter 3 mm
- Angle of incidence on sample (for central beam) 45°
- Max. solid sample plane dimensions 30 x 30 mm
- Max. solid sample height 13 mm

AT01L – focusing attached module with liquid cell and adjustable layer thickness

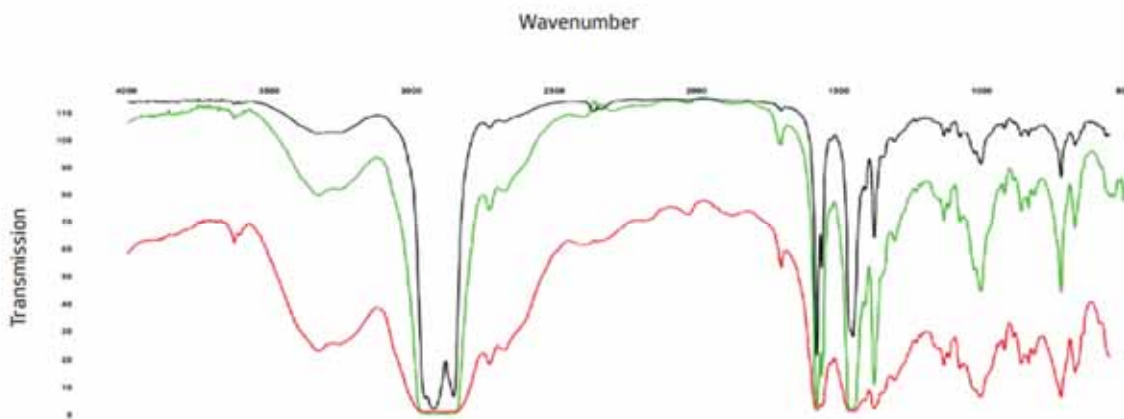
Main advantages

- Liquids of any viscosity grade analysis
- Line not require long sample preparation
- On-Line layer thickness control



Substrates with ZnSe windows allow registering spectra of samples with water content.

On-line sample layer thickness control allows to choose optimal layer thickness to increase IR spectra signal.



AT01D – attached module with cooled MCT detector

Main advantages

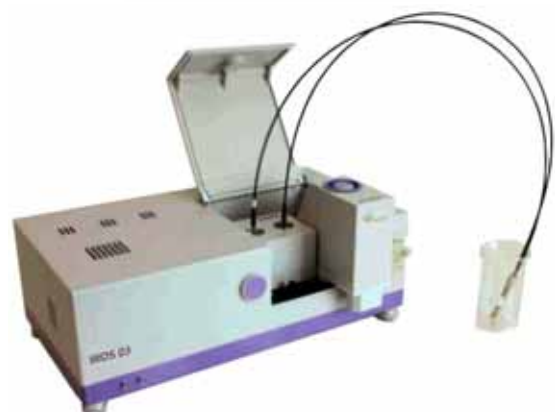
- High scanning speed
- High sensitivity
- Ideal solution for gas analysis

Designed for applications with extremely low IR spectra intensity

- LED IR probes
- Low gas concentration in multi-pass gas cuvette
- Distant and low power light sources
- Other cases requiring high sensitivity for IR signals

Main characteristics

- Time for 50 scans spectrum registration (resolution 4 cm^{-1}) – 20 seconds
- Photodetector receiving area 1 mm x 1 mm
- Cryostat capacity 200 ml
- Operating time after cryostat filling 6 hours



IROS Wide-range IR Microscopes



IR M3 high-end wide-range IR microscope

Spectrum registration modes

- Transmission
- Reflection (specular and ATR)

Two built-in detectors

- MCT with nitrogen cooling
- MG-32M (DLATGS analog)



Revolver mechanism allows to combine several special objectives

- ATR objective
- IR objective
- Visual objective

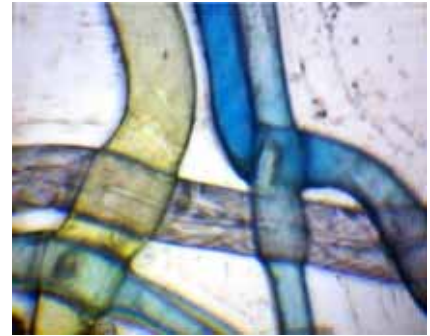
The microscope is mounted outside the cell compartment close to the spectrometer.

The visual channel is overlaying with IR channel for sample observation (aiming) and IR spectrum registration.

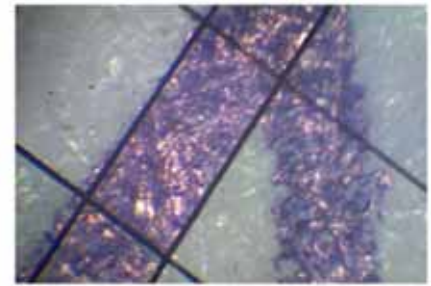
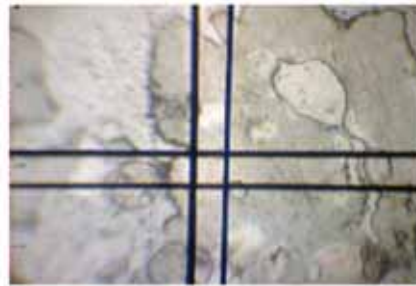
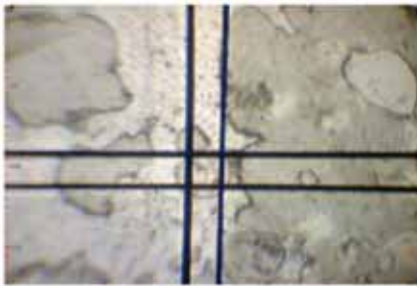
For sample observation, there are eyepieces and built-in video camera installed.



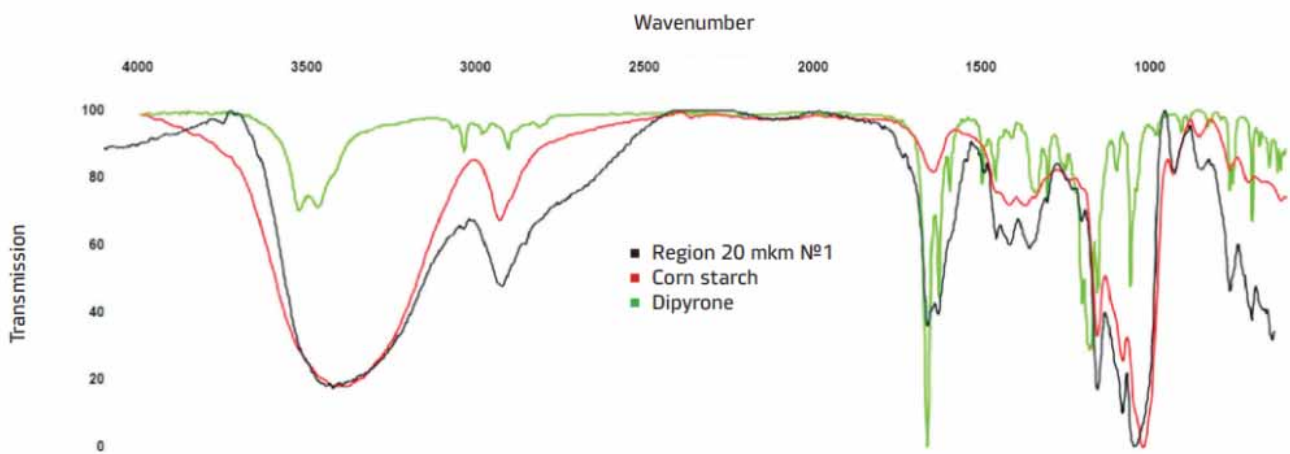
IR M2 wide-range IR microscope



Rectangular and iris diaphragms allow to select IR spectrum registration area. Rectangular diaphragms made of special glass opaque in wide IR range are the most convenient.



IR M2 and IR M3 IR microscopes allow to register spectrum from 10 μm and 5 μm samples respectively.



IR M3 features

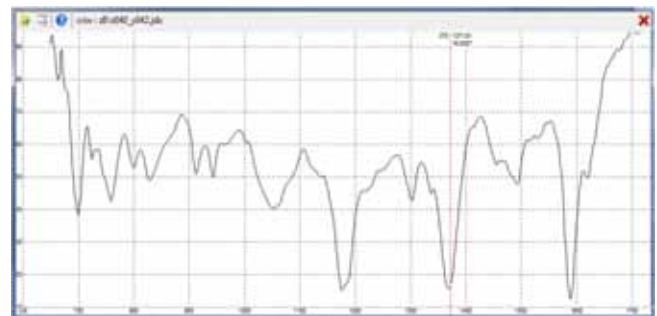
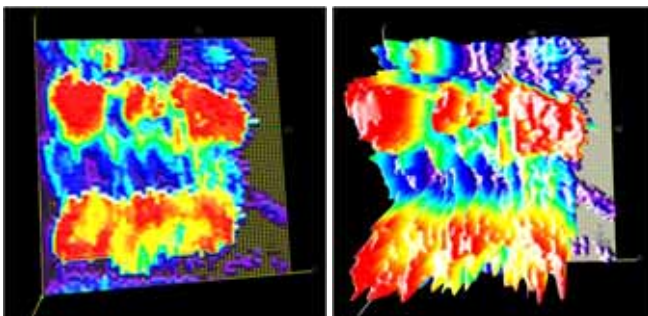
- **Fully automatic** Iris and rectangular apertures
- 4x, 10x, 36x, 60x interchangeable visible objectives
- Advanced **built-in control panel**
- **Automatic mapping system** (motorized sample stage with autofocus system)
- Special software for microscope control and results processing
- **Slider ATR** attachment

Built-in control panel allows to manage spectra registration process, photometric area observation (using binocular), quick sample change, sample stage manipulation and brightness illumination adjustment simultaneously.



Mapping using IR M3 microscope

Motorized sample stage with autofocus system allows to receive sample spectrum map in automatic mode.



IR spectrum of office marker pens strokes with various chemical compositions



“Spectral map” shows impurities concentration at different points of a sample in the form of relief or color gradations.

Specification

	IR M2	IR M3
Spectral range	6 000 – 600 cm ⁻¹ (for MCT detector with liquid nitrogen cooling)	
Resolution	0.5 cm ⁻¹	
Minimal linear sample dimension	10 μm	5 μm
Sample stage	Manual control	Automatic control, motorized
	Range 40×40 mm, step 2.5 μm	
Autofocus system	NO	YES
ATR mapping	NO	YES
Spectra registration modes	Transmission, reflection (e.g. with double sample transmission), attenuation total reflection (with ATR lens). Simultaneous IR spectra registration and visual sample observation	
Signal-to-noise ratio	≥12 000 RMS	≥20 000 RMS
	measurement time 1 min, resolution 4 cm ⁻¹ , range 2 200 – 2 000 cm ⁻¹ and liquid nitrogen cooled MCT detector	
Typical spectra registration time	10 – 60 s	
Zoom:		
• IR lens	15x	
• visual lenses	4x, 10x (optional)	4x, 10x, 36x or 60x
• IR ATR lens	36x or 60x	
• total with binocular	250x	
• total with 2 MPX video camera	600x	
Number of Cassegrain lenses in the optical system	3 (without optional ATR lens)	
Lens change system	Revolver mechanism with changeable lenses	
Photodetectors installed in the microscope	Cooled MCT detector (working time with 200 ml of nitrogen >6 hrs), air-cooled pyroelectrical MG-32M detector (DLATGS analog)	
Visible light source	High intensity LED	
Diaphragms	Adjustable and rectangular	
Video camera	Integrated, 2 MPX, USB	
Weight	≤16 kg	≤17 kg
Dimensions	330 × 200 × 580 mm	

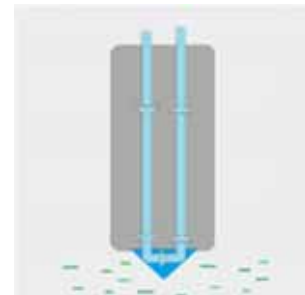
The parameters were measured using combination of IR M2/M3 with IROS 03 FTIR spectrometer.

FiPOS ATR Fiber Probes

Flexible ATR fiber probes enable a remote spectroscopy in-situ in real time to see all key spectral bands with no need of the sampling and place sample into the sample chamber, and makes remote analysis possible for molecular reaction monitoring in-line. Mid-IR measurements can nowadays be performed with advanced fiber optic probes as well.



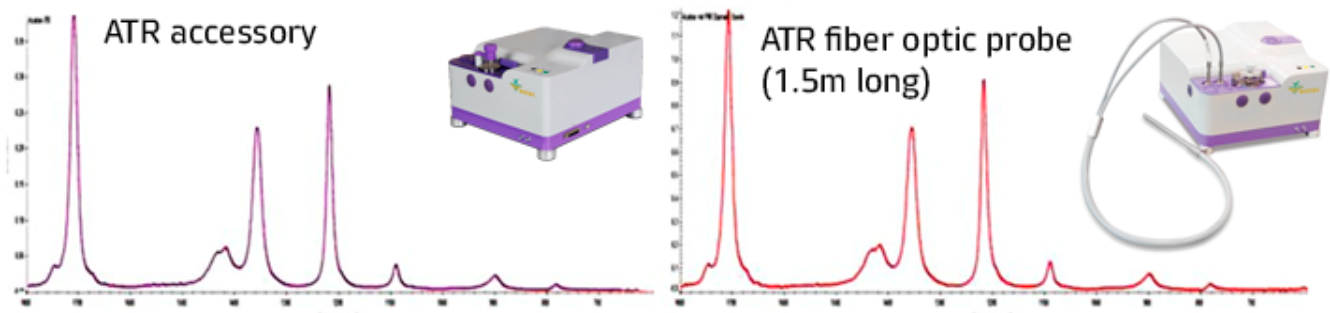
Ray-tracing is very simple – the radiation goes from the input fiber to the ATR crystal and reflects inside into the output fiber. The ATR crystal is reliably fixed inside metal or polymer parts of the tip, sealed with polymer ring and cannot fall away.



Ostec and **art photonics** work together as strategic partnership on development, production and commercialize **FiPOS** ATR fiber probes for the wide spectral range. The latest generation of **FiPOS** Mid-IR ATR Probes works with any type of FTIR and other IR spectrometers, photometers and IR-LED or QCL spectral sensors.



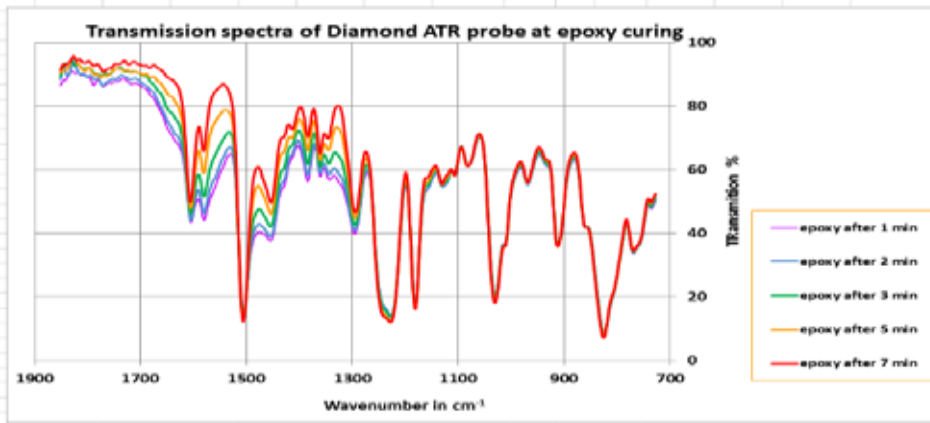
FiPOS ATR immersion fiber optic probes with patented design are suitable for reaction monitoring in lab, pilot plant and for fully automated process control.



Identical spectra are obtained by measuring the sample using the ATR sampling accessory and by the help of the fiber optic ATR probe coupled with the same spectrometer.

Application: on-line reaction monitoring

High or low temperature, high pressure or vacuum, harmful or poisonous mixture in the reactor or simply fast change of the mixture composition at the sampling and measurement at the room conditions – all these conditions push the customer to choose and use fiber optic for the remote reaction monitoring.



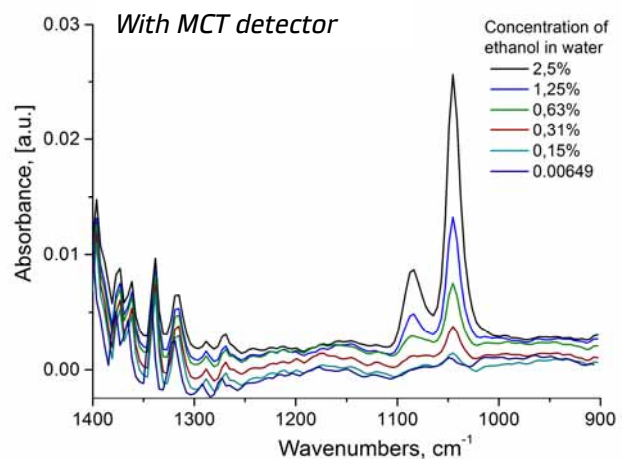
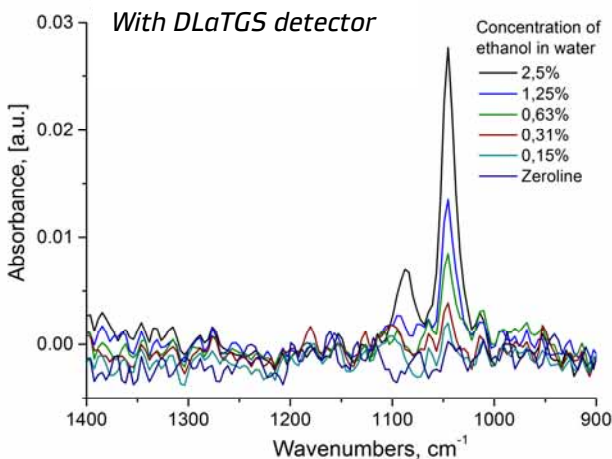
- Chemical synthesis
- Extraction, dissolution, crystallization
- Degradation and contamination of oils
- Cryo reactions
- Sludge measurements
- Determination of hydroxyl number of polyols
- Monitoring of anti-solvent crystallization
- Analysis of solvent mixtures

IROS 05 with ATR probes



IROS 05 can be equipped simultaneously with two detectors (pyroelectric and MCT TE- or LN₂- cooling) and allows you to connect two ATR fiber optic. Software allows intermittent interrogation of both optical fibers, which optimizes the work on several projects simultaneously.

The advantage of working with an MCT detector with liquid nitrogen cooling reveals the full potential of the method of working with ATR fiber optic probes.



Ostec offers a wide range of **FiPOS** ATR fiber optic sensors for various research and industrial applications.



Standard probes



High temperature probes



Sterilizable probes



Probes for Lab Applications



Loop probes

FiPOS standard fiber optic ATR probes

FiPOS Near & Mid-IR fiber ATR probes produced for any type of FT-NIR, FT-IR and other IR-spectrometers, photometers and IR-LED or QCL spectral sensors. ATR immersion fiber optic probes with patented design are suitable for reaction monitoring in lab, pilot plant and for full automated process control.



Main features

- High throughput in any part of Near & Mid InfraRed-spectrum
- ATR-tip shaped for immersion in liquid flow without dead zone
- Flexible and robust for industrial applications in harsh environment
- Compatible with all spectrometers and automated process-interfaces

Applications

- Reaction monitoring in real time
- Process Analytical Technologies (PAT)
- Remote polymerization control
- Crystallization process screening in-situ IR-spectroscopy for PAT in chemical, petrochemical, atomic, biopharmaceutical & food industry

FiPOS high temperature fiber optic ATR probes

FiPOS fiber optic ATR probes for harsh environment can be used for process-spectroscopy in Near & Mid IR range to monitor reactions in-line in a broad temperature range from -150° to +250°C. They can resist to high pressures up to 200Bar and used with FTIR or any other IR-spectrometers and spectral sensors in automated process control with process-interfaces.



Main features

- High throughput in selected parts of Near & Mid InfraRed-spectra
- ATR-tip shaped for immersion in liquid flow without dead zone
- Robust for industrial applications in harsh environment up to 250°C
- Resistant to high pressure
- Compatible with all spectrometers and automated process-interfaces

Applications

- Remote reaction monitoring in-line in temperature range -150/+250°C
- PAT applications in lab, pilot plant or industry with process-interfaces for automated process control
- Polymerization process control
- In-situ IR-spectroscopy for PAT in chemical, petrochemical, atomic, biopharmaceutical & food Industry

FiPOS sterilizable fiber optic ATR probes

Unique Shaft-in-Shaft design enables use of **FiPOS** ATR Probe in Bio process where sterilization is required without having to forgo the renown advantages of Mid-IR FTIR spectroscopy.



Main features

- Fiber assembly is easy detachable
- No need to retract the whole probe out of the fermenter, just pull the fiber assembly out of the operational shaft and store it separately
- Sealing the operational shaft is possible for the sterilization, cleaning, deactivation or any other treatment

Applications

- Reaction monitoring in real time
- Process Analytical Technologies (PAT)
- Remote polymerization control
- Crystallization process screening
- In-situ IR-spectroscopy for PAT in chemical, petrochemical, atomic, biopharmaceutical & food industry

FiPOS fiber optic ATR probes for lab applications

FiPOS ATR probes for laboratory applications with PEEK shaft are cost effective and perfect to use in small lab reactors and open vessels. They do not contain metal parts in the tip and can be used for the monitoring of electrochemical reactions, potentiometric cells, measurements in high-frequency fields.

PTFE tip is available on request.



Main features

- Evanescent absorption spectra without dead zone problems
- Optimal ATR- crystal selection to match customer application
- Cost effective solution for in-line reaction monitoring

Applications

- Reaction monitoring in real time
- Remote polymerization control
- Crystallization process screening
- In-situ IR-spectroscopy for soft surfaces, pastes and liquids

FiPOS fiber optic ATR loop probes

FiPOS ATR loop PIR fiber probes are perfect for remote analysis of composition of liquids, pastes and soft surfaces with no need in sample preparation. An unusual ATR tip is a Polycrystalline fiber loop. It is attached to fibers and is replaceable or disposable. Loop fiber probe is the simplest one to enable low cost ATR-spectroscopy.

Kits of 5 or 10 fiber loop tips can be purchased separately to be used with the fiber probe bought once. Loop tips can be made with several fiber turns to enhance sensitivity of such tip.



Main features

- High throughput at Mid IR range
- On-line absorbance spectroscopy of liquids, pastes & soft solid surfaces
- Compatible with all FTIR, QCL and IR- Filter spectrometers
- Cost effective alternative to more expensive ATR-IR-fiber probes
- Replaceable ATR Loop PIR-Fiber Tips



Applications

- Remote evanescent absorption (ATR-) spectroscopy in-situ
- Multiple ATR-spectroscopy by immersion of fiber loop in liquid
- In-vivo molecular spectroscopy for medical diagnostics by simple touch of ATR-Loop to skin or tissue

IROS Spectrometers Comparison Table

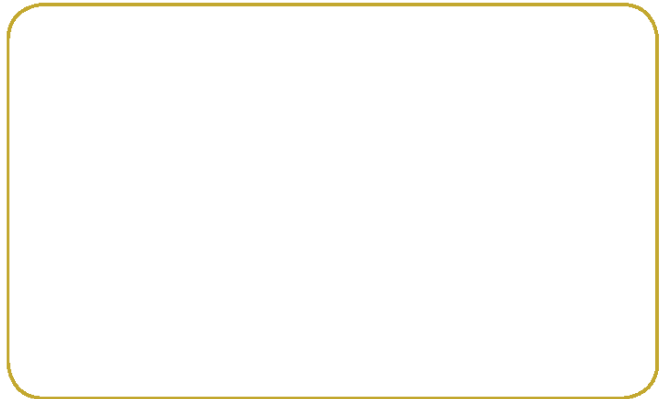
Parameter	IROS 05	IROS 05i	IROS 03
Interferometer	Double Cat's Eye		
Spectral resolution	0.5 cm ⁻¹	0.4 cm ⁻¹	
Spectral range with pyroelectric detector	5 700 – 470 cm ⁻¹	5 700 – 470 cm ⁻¹ with ZnSe beam splitter 7 900 – 350 cm ⁻¹ with KBr beam splitter and photodetector window	
Spectral range with DLaTGS detector	8 500 – 470 cm ⁻¹		
Spectral range with MCT detector	6 000 – 600 cm ⁻¹		
Beam splitter	ZnSe	ZnSe CVD, KBr	
Detector	MG-32M, DLaTGS, Si, InGaAs, MCT LN2 or TE cooling, LiTaO ₃		
Light source	SiC		
Signal-to-noise ratio with pyroelectric detector	≥40 000 RMS	≥50 000 RMS	
	(1 min acquisition, 4 cm ⁻¹ resolution, 2 200 – 2 000 cm ⁻¹)		
Integrated ATR	Yes	Optional	No
SMA connectors for connecting fiber optic probes	Yes		
Sealed housing	No	Yes	
IR microscopes connection	IR M2/M3	No	IR M2/M3
Plug-in external devices	Reflecting telescope for remote research, multi-pass gas cell, etc.	No	Multi-purpose ATR/SDR module, specular and diffuse reflection module with 45°/15° beam angle, focusing module with adjustable stage, multiple ATR module, cell with temperature controller, focusing module with liquid cell, focusing module with parabolic optics, cooled MCT detector, etc.
Dimensions (WxHxD)	34×20×38 cm	41×20×41 cm	63×21×30.5 cm
Weight	15 kg	25 kg	18 kg



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