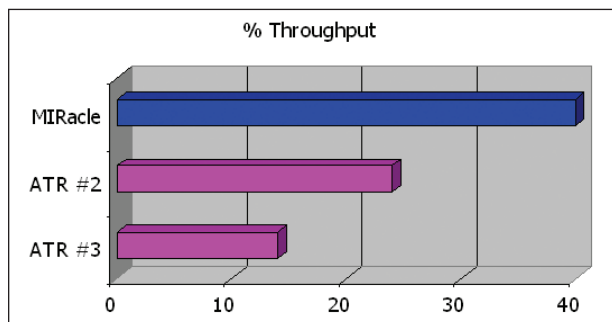


MIRacle ATR – *Fast and Easy IR Sampling*



FEATURES OF THE MIRACLE

- *Highest IR throughput – saving you time and improving your analysis quality*
- *Complete flexibility – add options to your MIRacle as your sampling needs change*
- *Highest value – for today's competitive analytical and research needs*
- *Fully configurable – ZnSe, Diamond, AMTIR, Ge and Si MIRacle crystal plates*
- *Pinned-in-place, changeable crystal plates – for fast and easy sampling optimization*
- *Highest purity, type IIa Diamond crystal – will not scratch and is chemically inert to acidic or caustic materials*
- *Optional specular reflectance plate – for measurement of coatings on reflective surfaces*
- *Choice of pressure clamps – high pressure, rotating high pressure, digital high pressure, viewing high pressure and micrometric sample clamps*
- *Sampling options – heating, temperature control, and flow through plate*

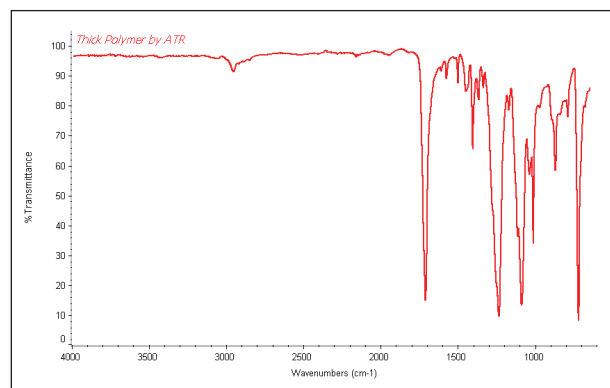


MIRacle – Highest IR Throughput ATR

The PIKE MIRacle™ is a universal ATR sampling accessory for analysis of solids, liquids, pastes, gels, and intractable materials. In its most popular configuration it is a single reflection ATR accessory with high IR throughput which makes it ideal for sample identification and QA/QC applications. Advanced options include three reflection ATR crystal plates to optimize for lower concentration components. Easily changeable crystal plate design provides analysis of a broad spectrum of sample types while ensuring constant sampling path length.

Single and three-reflection ATR crystals are available to optimize general qualitative analysis or quantitative analysis of minor components.

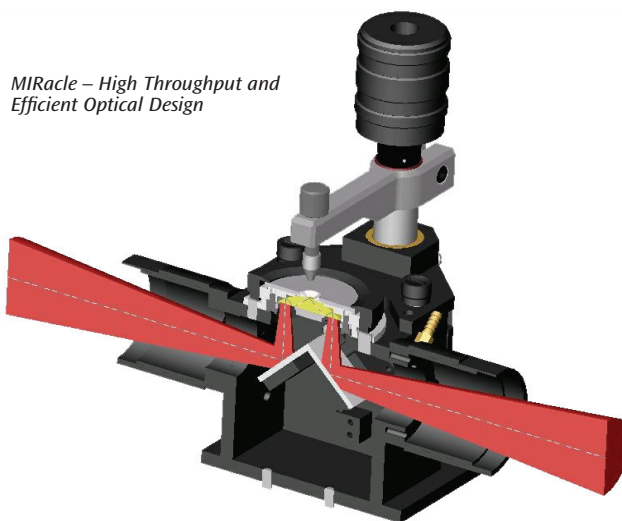
The PIKE MIRacle provides higher throughput – saving you time and generating higher quality spectra.



Thick Polymer Sample, using MIRacle with AMTIR Crystal and High-Pressure Clamp – No Sample Preparation.

MIRacle Optical Design

In the patented MIRacle optical design the ATR crystal both focuses the IR beam and provides the ATR sampling interface. This technology provides much higher throughput than competitive products and saves you considerable time and provides you higher quality spectra.



MIRacle – High Throughput and Efficient Optical Design

Table 1: MIRacle Crystal Plate Specifications

MIRacle Crystal Plate	Application	Hardness kg/mm ²	Cutoff cm ⁻¹ , Spectral Range	Refractive Index @ 1000 cm ⁻¹	Depth of Penetration @ 45°, μ	pH Range of Sample
AMTIR	Harder than ZnSe, ok with acid samples	170	630	2.5	1.70	1 – 9
Diamond/ZnSe	Ideal for hard samples, acids or alkaline	5700	525	2.4	2.00	1 – 14
Ge	General purpose and carbon filled or rubber	550	575	4.0	0.66	1 – 14
Si/ZnSe	General purpose – only below diamond for hardness	1150	550	3.4	0.85	1 – 12
Si	Excellent for far-IR spectral measurement	1150	8900-1500, 475-40	3.4	0.85	1 – 12
ZnSe	General purpose ATR crystal	120	520	2.4	2.00	5 – 9

MIRacle Crystal plates are covered by PIKE Technologies patent numbers 5,965,889 and 6,128,075 or are manufactured under license of 5,200,609, 5,552,604 and 5,703,366.

MIRacle Crystal Options

The MIRacle ATR accessory is available with 5 different crystal types (ZnSe, Diamond, Ge, Si, and AMTIR) and with unique versions of these crystal materials.

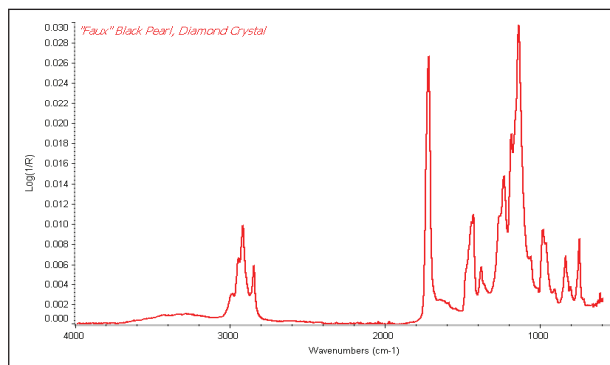
Crystal plates are pinned in place and easily changeable within seconds with no alignment required. With this flexibility, you can change the crystal type to exactly match your sampling requirements. For example, diamond is ideal for brittle samples because it will not scratch, whereas, Ge is ideal for carbon filled samples because of its high refractive index and lower depth of penetration. Three reflection crystal plates provide increased sensitivity for minor components in liquid or non-rigid materials.

Our diamond, Si and AMTIR crystal plates are manufactured using Hastelloy so they are compatible with acidic and corrosive samples. The MIRacle base optics includes a trough insert and volatiles cover, both compatible with all crystal plates – so you do not need to purchase flat and trough crystal plates.

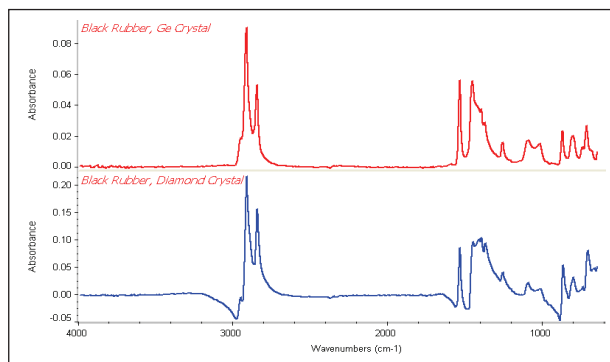
Table 1 shows MIRacle ATR crystal characteristics including refractive index, spectral range cutoff, pH range and hardness for single reflection ATR crystal plates. *Still have questions?* Please call as we are pleased to discuss your sampling requirements.



MIRacle ATR Crystal Plates



"Faux" Black Pearl with MIRacle using Diamond ATR Crystal



Black Rubber Samples are best run using Ge ATR Crystal

MIRacle Pressure Clamps are Pinned-in-Place and Easily Upgraded



MIRacle Digital Clamp
Ideal for Controlled Pressure



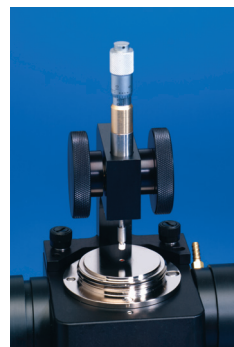
MIRacle Rotating Clamp
Ideal for Cleaning Tip of Debris



MIRacle Viewing Clamp
Ideal for Placing Fibers or Crystals



MIRacle High-Pressure Clamp – Ideal for Routine Sampling



MIRacle Micrometer Clamp – OK for Low Pressure Applications

MIRacle Pressure Clamp Options

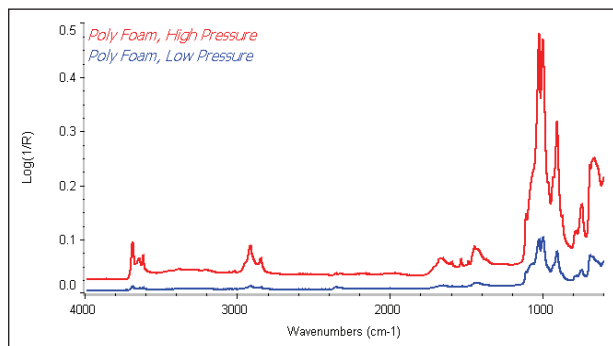
MIRacle pressure clamps are pinned in place and easily changeable within seconds. A high-pressure clamp is recommended for most applications and is available in digital, rotating and viewing versions. All clamps (except the viewing clamp) include tips for hard, soft and pellet shaped samples. High-pressure clamps are calibrated to deliver over 10,000 psi of pressure when used with the single reflection crystal plates.

Ability to deliver high pressure is very important for achieving spectral quality. In the example below, we demonstrate spectral differences for a porous polymer sample measured with the micrometer clamp and the high-pressure clamp. Clearly the spectrum obtained using the high-pressure clamp is required for a high quality result.

MIRacle high-pressure clamps utilize a slip-clutch mechanism to prevent excessive pressure from being applied to the crystal.

MIRacle Clamp Pressures	Max. Lbs. Pressure	Crystal Diameter, mm	PSI
High-Pressure Clamps	40	1.8	10,141
		6.0	913
Micrometer Pressure Clamp	8	1.8	2,028
		6.0	183

Note: All clamps except Micrometer are high pressure



Porous Polymer Sample Measured Using High and Low-Pressure Clamp

MIRacle Sampling Options

The MIRacle can be configured with optional resistively heated crystal plates using a PIKE temperature control module. Digital and digital with PC control versions are available. The PC control module includes TempPRO software which provides a graphical user interface for temperature control and kinetic measurements.

An optional water jacket for MIRacle ATR crystal plates provides the ability to cool or elevate ATR sampling temperature via a water circulator.

TempPRO software for graphical setup and control of kinetic measurements



MIRacle with Optional Heated Crystal Plate, Flow Cell and PIKE Temperature Control Module

MIRacle ATR Summary

The MIRacle ATR accessory is a high performance FTIR sampling tool for solid, liquid, or polymer samples. Easily changeable crystal plates provide optimized spectral data for unique sample types. With options for single or three reflection crystal plates, several pressure clamp styles and heating or cooling the MIRacle is able to address a wide range of FTIR sampling applications.

ORDERING INFORMATION

MIRacle Base Optics (must select, insert spectrometer model for XX)

PART NUMBER DESCRIPTION

025-18XX	MIRacle ATR
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Notes: MIRacle Base Optics includes liquids plate, volatiles cover, purge tubes, purge kit and spectrometer base mount. Please see the FTIR instrument code sheet.

MIRacle Crystal Plates (must select 1 or more)

PART NUMBER DESCRIPTION

025-2100	Single Reflection Diamond/ZnSe Crystal Plate
025-2110	3 Reflection Diamond/ZnSe Crystal Plate
025-2010	Single Reflection ZnSe Crystal Plate
025-2030	3 Reflection ZnSe Crystal Plate
025-2050	Single Reflection Ge Crystal Plate
025-2070	Single Reflection AMTIR Crystal Plate
025-2090	Single Reflection Si/ZnSe Crystal Plate
025-2096	Single Reflection Si Crystal Plate
025-2200	Specular Reflection Plate

Notes: MIRacle Crystal Plates are pre-aligned and pinned-in-place. Changing crystal plates is easy and fast to optimize sampling results.

MIRacle Sampling Options

PART NUMBER DESCRIPTION

025-5010	Water Jacket – fits all crystal plates
025-5012	Flow-through Attachment
025-4010	MIRacle Heated ZnSe Crystal Plate
025-4050	MIRacle Heated Ge Crystal Plate
025-4070	MIRacle Heated AMTIR Crystal Plate
025-4090	MIRacle Heated Si Crystal Plate (60 C Max)
025-4100	MIRacle Heated Diamond/ZnSe Crystal Plate (60 C Max)
076-1410	Digital Temperature Control Module, PC Control
076-1210	Digital Temperature Control Module

Notes: Water Jacket requires customer water circulator. Maximum crystal temperature is 130 °C, except where otherwise stated. Flow through attachment is compatible with all crystal offerings. Temperature controller selection is required for heated crystal plates. Digital temperature controller with PC control includes TempPRO software.

Specifications for Resistively Heated MIRacle Plates

Temperature Range:	Ambient to 65 or 130 °C
Accuracy:	+/- 0.5%
Voltage:	24 VAC
Sensor Type:	3 wire Pt RTD (low drift, high stability)

Controllers

Digital:	+/- 0.1% of set point
Digital PC:	+/- 0.1% of set point, graphical setup, up to 3 ramps, USB interface
Input Voltage:	110/220 V, switch able
Output Voltage:	10A/24 VAC

MIRacle Pressure Clamps

(must select 1 or more for solids or polymer analysis)

PART NUMBER DESCRIPTION

025-3090	Digital, High-Pressure Clamp
025-3020	High-Pressure Clamp
025-3075	Rotating, High-Pressure Clamp
025-3300	Viewer, High-Pressure Clamp
025-3050	Micrometric, Low-Pressure Clamp
025-3035	Confined Space Clamp

Notes: The High-Pressure Clamp is recommended for general applications. Pressure clamps include a flat tip, a swivel tip and a concave tip.

MIRacle Replacement Parts

PART NUMBER DESCRIPTION

025-3051	MIRacle Volatiles Cover
025-3056	Teflon Insert for Liquids Plate (set of 2)
025-3058	Teflon Insert for 3 Reflection Plate (set of 2)
025-3057	MIRacle Mounting Ring
025-3059	MIRacle Liquids Metal Plate
025-3095	Flat tip for High-Pressure Clamps
025-3093	Swivel tip for High-Pressure Clamps
025-3092	Concave tip for High-Pressure Clamps
025-3096	Sealed Pressure Tip for High Pressure Clamp
025-3052	Flat tip for Micrometric Clamp
025-3061	Swivel tip for Micrometric Clamp
025-3054	Concave tip for Micrometric Clamp
025-3094	Pressure tip for 3 reflection crystal plates
025-3091	Digital Clamp Battery Pack

Notes: Please contact PIKE Technologies for items not described in this list.