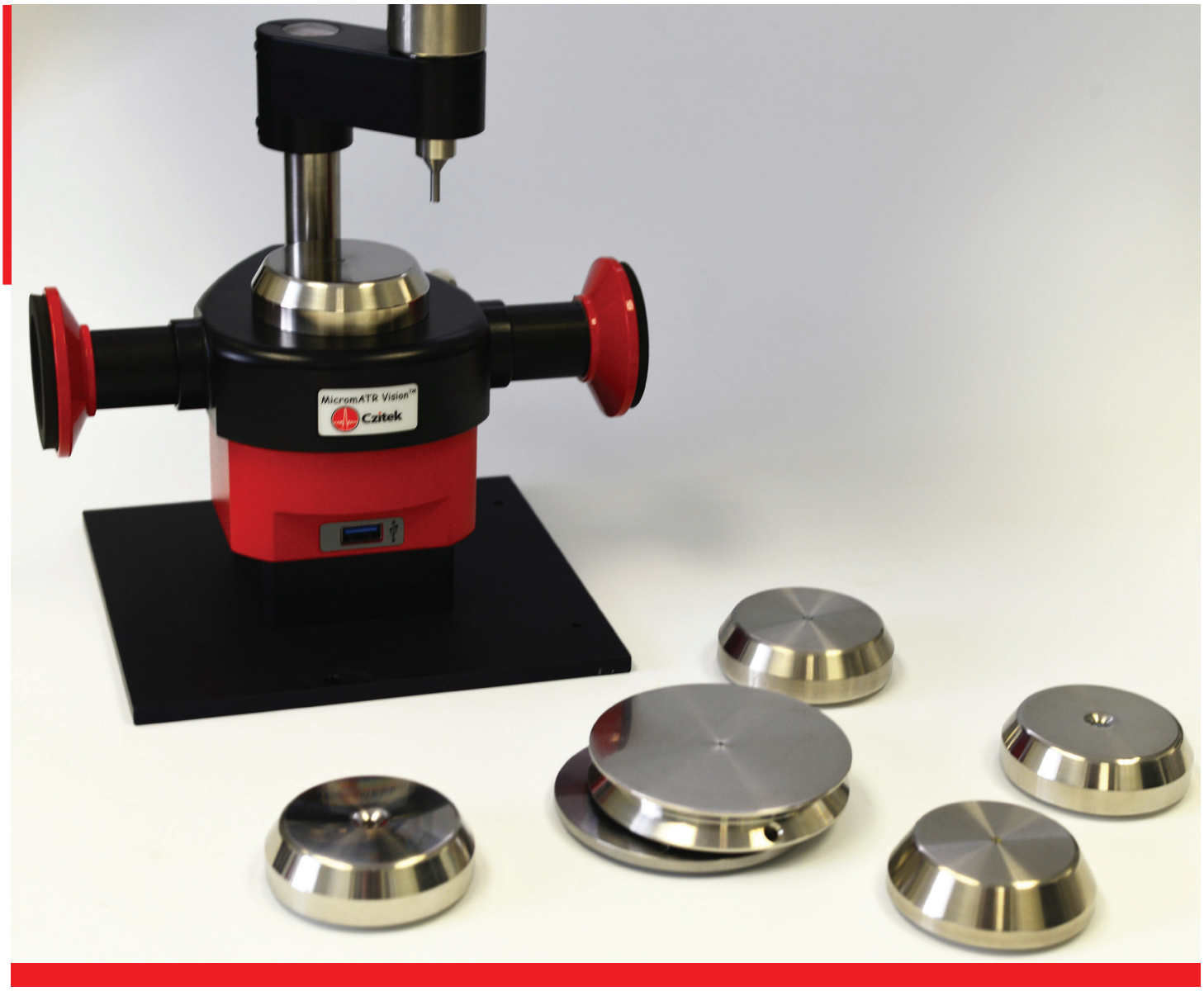
MicromATR – The Universal ATR Accessory

Czitek



The MicromATR™ attenuated total reflection (ATR) accessory offers the widest variety of options of any accessory on the market. With a wide variety of ATR crystal options, optional reflection adaptor, temperature control accessories and the outstanding viewing capabilities of the MicromATR™ Vision package, this single system can handle the majority of your infrared measurement needs. The alignment free system allows ATR crystal disks to be easily changed… no screws, not tools, snap and go. The system is easy to clean and provides the highest throughput available. From vision to quant, heating to reflection, the MicromATR™ provides the most measurement options of any commercially available ATR accessory.

MicromATR Features

- Highest throughput, cost effective diamond ATR accessory
- Complete mid-IR and far-IR spectral range
- Kinematic ATR sampling plates – optimal position every time
- Compatible with both Czitek and Duradisk™ ATR disks
- Compact optical design fits into most all commercial FT-IR's
- Upgradable to Vision™ – covers samples from macro to micro

The Power of Vision

MicromATR Vision combines a rugged and versatile diamond ATR sample interface with an integrated video camera, allowing you to see exactly what you're measuring. This combination makes it easy to align small samples for precise measurement and provides documentation of the measurement area. Using a USB interface and Czitek's eSpot software, the MicromATR Vision provides a modern, intuitive interface. In addition to the advantages of viewing, the MicromATR Vision base is fully compatible with all options listed in this brochure.

VIEW YOUR SAMPLE WHILE YOU SCAN

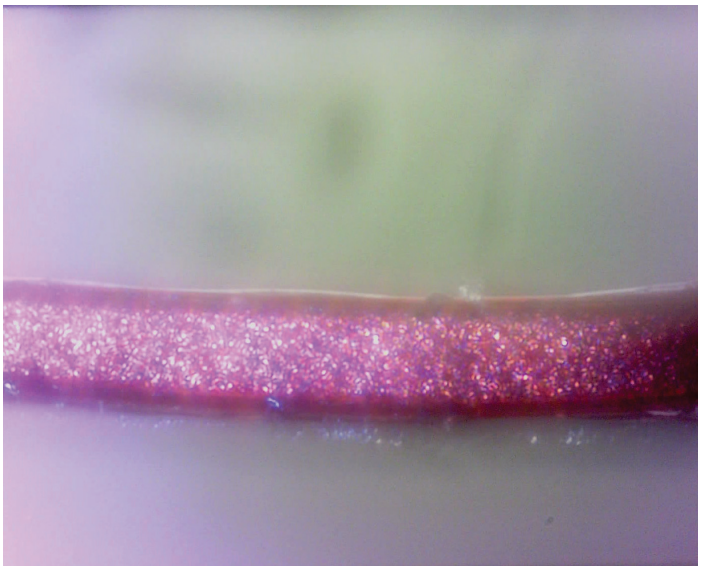


Figure 1: Image of wire insulation on MicromATR Vision through the diamond ATR.

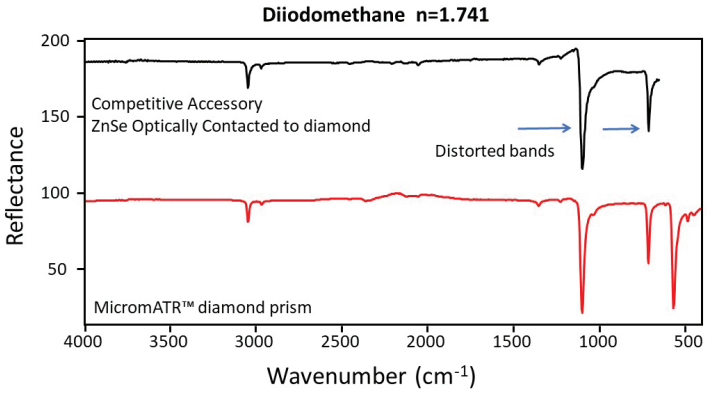


Figure 2: IR spectra of diiodomethane, showing symmetric bands when measured with the MicromATR.

Unsurpassed Spectral Quality

The MicromATR series of ATR accessories provide the highest quality spectral measurements available. They have been engineered to eliminate both band distortion and stray light effects that are commonly observed in competitive ATR accessories. In ATR measurements, band distortion is especially strong with samples of high refractive index. The MicromATR was designed to measure high refractive index samples as is shown in Fig. 2; the MicromATR produces sharp, symmetric bands that allow for easy spectral matching and interpretation.

Stray light in any accessory can adversely affect absorbance values and linearity in quantitative analyses. These effects can be seen in Fig. 3. The MicromATR has the least amount of stray light compared to any competitive accessory, allowing for sensitive and accurate quantitative measurements.

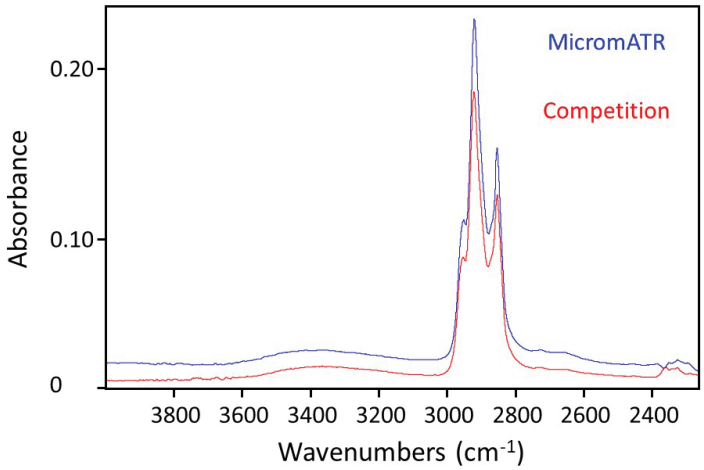


Figure 3: IR spectra of hydrocarbon oil showing increased absorbance due to low stray light in the MicromATR.

Extensive ATR disk options to fill all your diverse sampling needs

Czitek provides a large selection of ATR disks to cover nearly any ATR measurement need. The universal compatibility and alignment free design allow the system to work effortlessly with any number of options. From identification of unknown solids to quantitation of dilute liquids, Czitek offers a MicromATR option that is sure provide the answers you need. All disks are made from 316 stainless steel and are held in place mechanically and magnetically. Additionally, hastelloy disk construction is available for extremely corrosive environments.

Single Reflection ATR Disks

Diamond high throughput (HT)

Diamond is the strongest and most chemically inert ATR crystal material. Single reflection diamond ATR is the industry standard for ATR analysis for identification and percentage level quantitation. Czitek's high throughput (HT) model provides the highest signal to noise and the unique View Thru design for use with Vision

- Robust and chemically inert type IIa diamond
- View Thru design
- AR coated to provide highest Signal-to-Noise possible

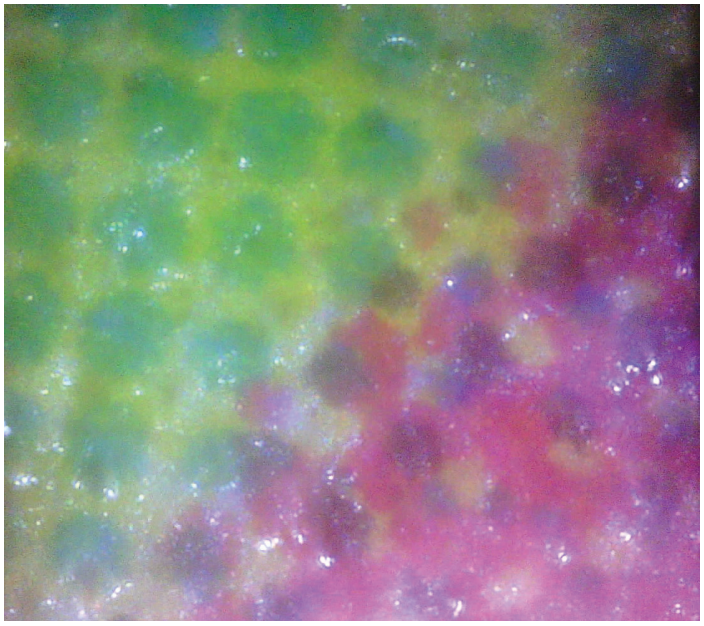


Figure 4: Image of ink printing through the diamond.

Diamond extended range (XR)

Czitek's single reflection extended range (XR) diamond ATR provides all of the advantages of diamond ATR into the FarIR region with a minimum frequency of 10 cm^{-1}. It's rugged and chemically inert with the same View Thru design.

- Robust and chemically inert type IIa diamond
- View Thru design
- Mid to Far IR: down to 10 cm^{-1}

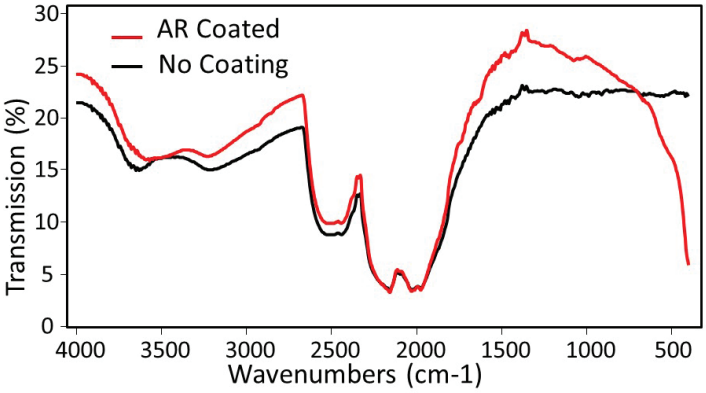


Figure 5: Throughput spectra of type IIA Diamond with and without the AR coating. HT in red; XR in black.

Germanium (Ge)

Single reflection germanium (Ge) ATR crystals have a high refractive index. This produces a low penetration depth that makes them ideally suited for surface analysis and measurement of samples with carbon black filling. Germanium is the one material that can be used to accurately identify elastomers used in o-rings, seals and tires. Less rugged than diamond, germanium is used only when an extremely short path length is needed.

- High refractive index and low penetration depth
- Ideal for carbon black filled materials
- Ideal for surface analysis

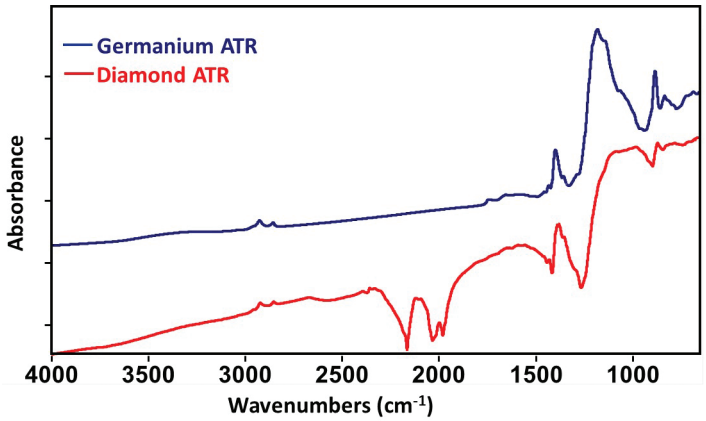


Figure 6: IR spectra of black rubber gasket comparing germanium to diamond ATR.

Zinc Selenide (ZnSe HT)

Zinc selenide (ZnSe) is a commonly used ATR crystal material. With the same refractive index of diamond, ZnSe provides similar spectra, at a lower price point. It isn't as durable or chemically resistant as the diamond options, but used properly it can give years of service. Using Czitek's proprietary View Thru design, the single reflection ZnSe can be used with the Vision system to view, capture and document pictures of your sample. Additionally, Czitek's high throughput (HT) coating provides the highest available transmission for fast, accurate measurements.

- Economical, single reflection ATR
- Good for chemical identification and quantification (% level)
- pH range 4 - 9
- View Thru design

Single Reflection Options

Part Number	Description
100-00-0025	MicromATR Single Bounce XR Diamond
100-00-0032	MicromATR Single Bounce HT Diamond
100-00-0026	MicromATR Single Bounce Monolithic Ge (Non-viewing)
100-00-0070	MicromATR Single Bounce HT ZnSe

Multireflection ATR Disks

When additional sensitivity is needed for low level detection or quantitation, multi-reflection ATR offers an attractive alternative to thin transmission cells. Easy to use and easy to clean, each reflection produces an integer increase in the path length. The increase in sensitivity is shown in Figure. 9. Czitek offers 3 and 9 reflection ATR disks in both diamond and silicon with an additional 9 reflection ZnS configuration. Using a composite design, each multi reflection disk provides high throughput providing sensitive measurements. The 3 reflection configurations can be used with both liquids and solids while the 9 reflection configurations are for liquids only, incorporating a liquid well. As with all Czitek ATR disks, these are constructed out of 316 stainless steel and mounted via pin and magnet, requiring no set up or alignment. Hastelloy disk construction for extreme corrosive environments is available upon request.

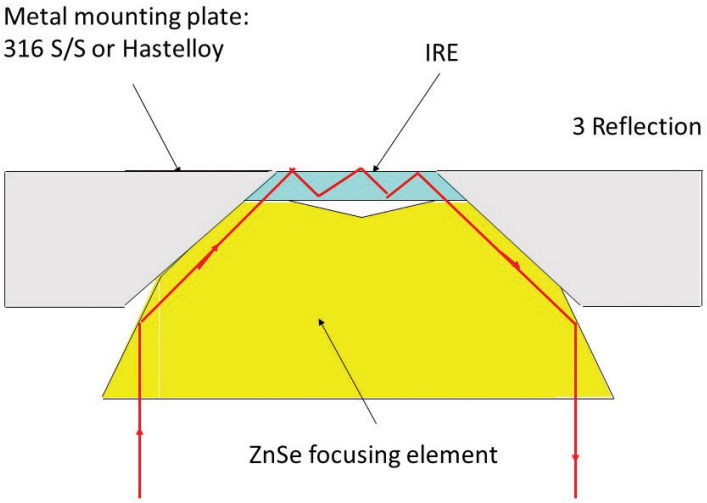


Figure 7: Optical Layout for three reflection diamond/ZnSe composite disk.

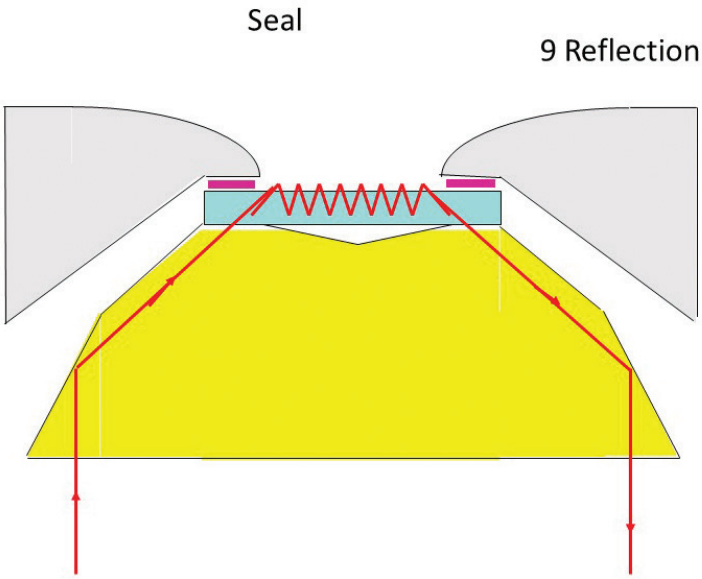


Figure 8: Optical Layout for nine reflection diamond/ZnSe composite disk.

Available multireflection crystal materials

Diamond – 3 & 9 reflection

Silicon – 3 & 9 reflection

Zinc Sulfide (ZnS) – 9 reflection

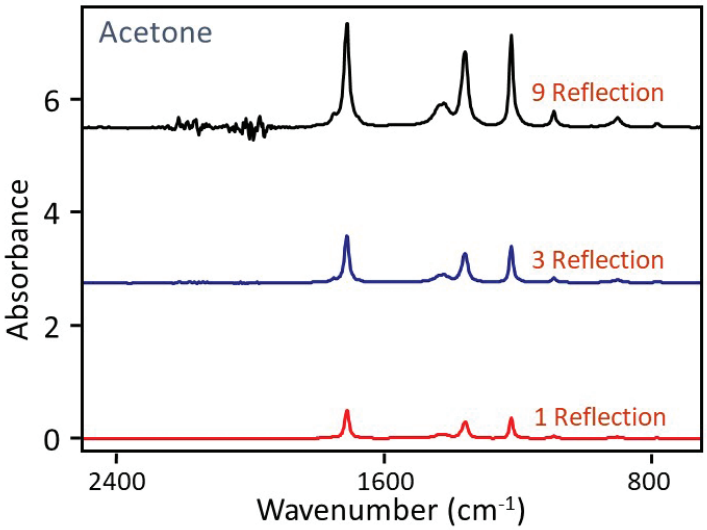


Figure 9: IR spectra of Acetone demonstrating the sensitivity difference between single, 3 and 9 reflection diamond ATR's.

Multi-Reflection ATR Disk Options

Part Number	Description
100-00-0028	MicromATR 3 Bounce Diamond/ZnSe Composite (Non-viewing)
100-00-0027	MicromATR 9 Bounce Diamond/ZnSe Composite (Non-viewing), liquids only
100-00-0131	MicromATR 9B Si/ZnSe Composite (Non-viewing), liquids only
100-00-0132	MicromATR 3B Si/ZnSe Composite (Non-viewing)
100-00-0068	MicromATR 9 Bounce ZnS/ZnSe (Non-viewing), liquids only

Temperature Controlled ATR Disks

Temperature controlled ATR accessories allow the study of phase transitions, reaction kinetics and measurement of temperature sensitive samples. Czitek offers ATR crystals in temperature controlled disks for these types of experiments. Both thermoelectrically heated and disks designed to be used with a recirculating heater/chiller are available in single, 3 and 9 reflection diamond configurations. The single reflection heated diamond disk also allows viewing to combine the visible picture with infrared data, especially useful for phase transition work. The thermoelectrically heated disks include an OMEGA heat controller with single, 3 & 9 reflection diamond disks. Heated disks are made from 316 stainless steel and attach to the MicromATR base via pin and magnet for easy, alignment free integration.

Heat Controller Features

- Capable of 130°C in 0.1°C increments
- Fully programable temp control with ramp and soak functions
- Both upper and lower temperature alarm set points

Part Number	Description
100-00-0129	MicromATR Thermoelectrically Heated Single Bounce Diamond XR
100-00-0130	MicromATR Thermoelectrically Heated 3 Bounce Diamond/ZnSe Composite (Non-viewing)
100-00-0136	MicromATR Thermoelectrically Heated 9 Bounce Diamond/ZnSe Composite (Non-viewing), liquids only

External Reflectance Accessory

For paints, coatings and thin films on metallic or reflective surfaces, external reflection provides a reliable technique for both identification and thickness measurements. To provide even more flexibility, Czitek offers an attachment which converts the MicromATR into a 45 degree specular reflection accessory. Constructed out of 316 stainless steel and integrating with Czitek's alignment free design, the external reflection accessory allows you to expand your capabilities simply and affordably.

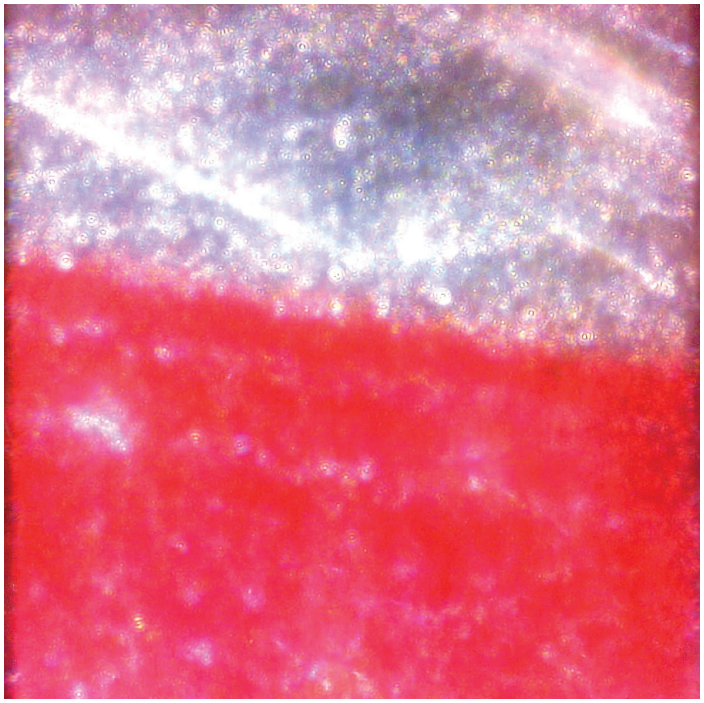


Figure 10: Red painted piece of aluminum

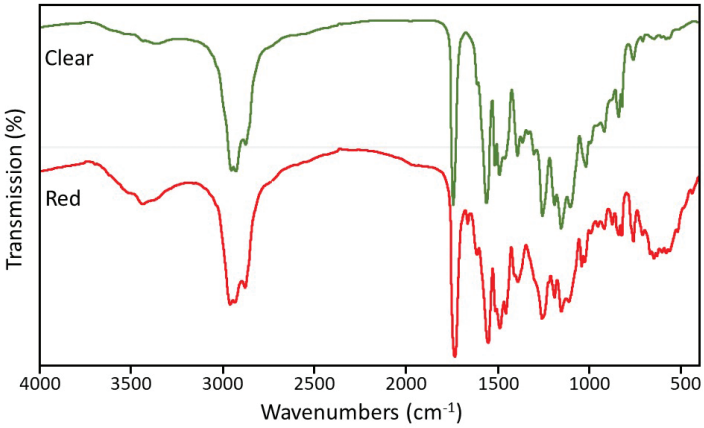


Figure 11: IR spectra of both the clear coating (Green) and red ink (Red) on an aluminum substrate.

Part Number	Description
100-00-0069	MicromATR External Reflectance Interface

Conclusion

The MicromATR and MicromATR Vision provide unappalled flexibility for a wide variety of infrared measurements. The MicromATR Vision is the only viewing ATR accessory that is designed to seamlessly integrate a wide variety of ATR crystal options including multi-reflection and controlled temperature systems. These accessories allow you to quickly change from one experiment to the next with no alignment or setup required, improving you efficiency and making your experiments easier.

MicromATR and MicromATR Vision Specifications

ATR Crystal Plates	Diamond XR (to 10 cm^{-1})
	Diamond HT (to 500 cm^{-1})
	Ge (to 500 cm^{-1})
	Si (to 650 cm^{-1})
	ZnSe HT (to 650 cm^{-1})
	Diamond 3 reflection(to 650 cm^{-1})
	Diamond 9 reflection (to 650 cm^{-1})
	Si 3 reflection (to 650 cm^{-1})
	Si 9 reflection (to 650 cm^{-1})
	ZnS 9 reflection (to 700 cm^{-1})
Sample Viewing	Fully integrated video
	Digital video and image capture
	(requires Diamond XR, HT or ZnSe HT)
Video Power and Output	USB 2.0
Crystal Plate Mount	Kinematic, magnetically fixed
ATR Crystal Dimensions	2.5 mm diameter (Diamond XR and HT)
	4.3 mm (Diamond 3X)
	6 mm (Diamond 9X)
Crystal Plate material	316 Stainless steel
Angle of Incidence	45 degrees, nominal
Focus Optics	Reflective
Pressure Clamp	Torque Knob
Maximum Pressure	30,000 psi (Diamond XR and HT versions)
Purge enclosure	Small purge volume
	Purge / seal tubes included
Dimensions	4.5 X 3.5 X 3.5 inches
	114 X90 X 90 mm
eSpot™ Software (Vision Only)	Requires Windows® 7, 8, 8.1 or 10

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