



MERIDIAN™: THE DIAMOND SPLITPEA™¹

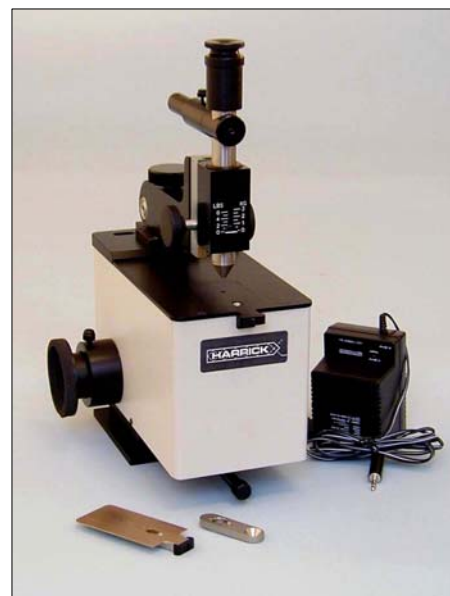
The Meridian™ is the ultimate accessory for examining small or extremely hard samples by internal reflection (ATR) spectroscopy. Harrick Scientific's Meridian™ is a horizontal ATR accessory with a sampling area less than 500 μm in diameter, the smallest area for any diamond ATR accessory. It is configured to apply localized, measured pressure to produce superior contact between the sample and its diamond ATR crystal. The Meridian™ is perfect for quick and easy examination of extremely hard samples, abrasive powders, and highly corrosive materials, in addition to routine analysis of small liquid, solid, and paste samples. For positioning samples on the small spot, a 50X viewing microscope, the ViewThruPress™, ² is available. The Meridian™ makes ATR microsampling even more simple and straightforward by integrating Harrick's PermaPurge™, ³ for rapid sample and crystal exchange with minimal purge interruption. The Meridian™ is an innovative alternative to infrared microscopes, beam condensers, and diamond cells.

APPLICATIONS

- ▶ Uniquely suitable for studying extremely hard samples; highly corrosive liquids; minerals; slightly curved samples; fibers; nanoliters of liquids and pastes; and defects on large panels.
- ▶ Invaluable for forensic and combinatorial chemistry samples.

FEATURES

- ▶ The most chemically inert, durable, and cleanable ATR crystal available: diamond.
- ▶ Small sampling area - less than 500 μm in diameter with its diamond ATR.
- ▶ Minimizes stray light due to the small sampling area.
- ▶ Wide spectral range: mid-IR to the FIR.
- ▶ High sample throughput due to little or no sample preparation.
- ▶ Calibrated pressure applicator for reproducible ATR measurements.
- ▶ Achieves optimal contact between the ATR crystal and hard samples.
- ▶ Flip-up, streamlined calibrated pressure applicator for easy access to sampling area
- ▶ ATR and external reflection capabilities provide application versatility.
- ▶ High energy throughput with DTGS detectors.
- ▶ Generally retains sample integrity.
- ▶ Harrick's exclusive PermaPurge™ allows rapid sample and crystal exchange without interrupting the purge of the system.
- ▶ Spill-resistant cover.
- ▶ Readily cleaned ATR crystal, due to the low adhesion properties of diamond.
- ▶ Inert ATR crystals available for use from the Near IR to the Far IR.
- ▶ Upgrade to a calibrated 50X ViewThruPress™ for easier viewing of the sampling area.
- ▶ Options include Flow-Through Liquid Cell and Heatable Sampling Plates for operation to 200°C.



INCLUDES

- ▶ One ATR holder with mounted diamond hemisphere.
- ▶ Sample holder adapter for studying powders by ATR.
- ▶ External reflection sample holder and alignment mirror.
- ▶ Mating hardware for the specified spectrometer.

¹U. S. Patent 5,210,418

²U. S. Patent 5,308,983

³U. S. Patent 5,177,561

ORDERING INFORMATION

OPTIONS AND REPLACEMENT PARTS.

	CATALOG NO.		CATALOG NO.		CATALOG NO.
Meridian™ Diamond SplitPea™		ViewThruPress™ Upgrade	UNS-MIC	Mounted Crystals: Ge	UNS-ATR-OJ
with ViewThruPress™	MER-P-XXX	Powder Adapter O-Ring	ORV-012	Heatable Sampling Plates:	
Meridian™ Diamond SplitPea™	MER-XXX	Mounted Crystals: Si	UNS-ATR-0E	Diamond	UNS-HOT-0W
Flow-Through Liquid Cell		Diamond	UNS-ATR-0W	Si	UNS-HOT-0E
with Luer Fittings	UNS-LCF	ZnSe	UNS-ATR-0M	Ge	UNS-HOT-0J
Liquid Cell O-Ring	ORV-0015	ZnS	UNS-ATR-0I		

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This diamond, horizontal micro-ATR accessory is ideal for analyzing a variety of samples, including hard solids, corrosive liquids and abrasive materials. Samples, which are difficult to analyze by conventional spectroscopic methods, such as fibers, rocks, paints, and microliters of liquids or

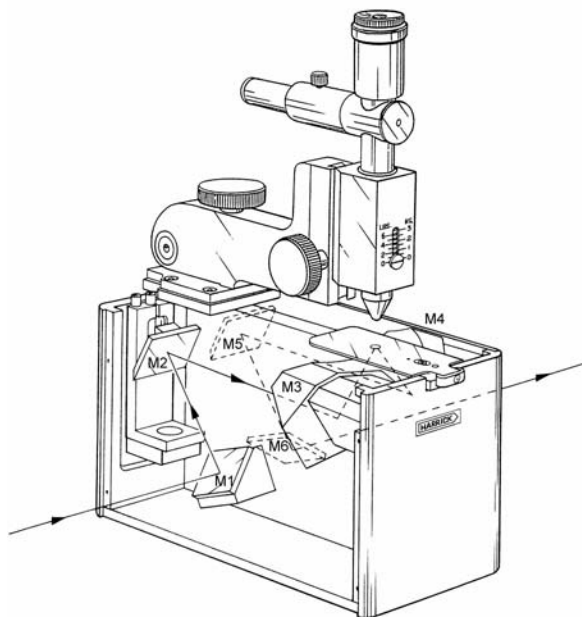


Figure 1. The Meridian™.

pastes, are easily examined with the Meridian™.

The Meridian™ can be configured for internal or external reflectance, simply by changing the sample holder. In its ATR mode, the Meridian™ features a removable holder for easy sample insertion and crystal cleaning. For external reflection and pre-alignment, the Meridian™ features a removable sample holder and reference mirror. The Meridian™ is enclosed in a purgable box for rapid sample exchange without interrupting the purge of the system.

An illustration of the Meridian™ is shown in Figure 1. Two mirrors, M1 and M2, direct the beam to an ellipsoidal mirror, M3, which focuses the light onto the sample. The radiation reflected from the sample is collected by a second ellipsoid, M4. Mirrors M5 and M6 direct radiation reflected from M4 to the detector of the spectrometer. This configuration provides a six times linear reduction of the source image on the sampling surface.

For ATR, the Meridian™ comes with one diamond ATR crystal. Diamond is extremely inert, allowing the analysis of highly corrosive materials. It also has a low friction coefficient, so samples do not adhere strongly to the surface, making sample clean-up simple and straightforward. Furthermore, diamond is an extremely hard material. This permits the application of high clamping pressures to ensure good contact between the IRE and the sample, even for samples as hard as rocks. Generally, lower pressures are required to achieve the good contact needed in ATR than are needed to flatten the sample for transmission studies. Thus

fewer chemical and physical changes will be induced in the sample with the Meridian™ than with a high pressure diamond anvil cell.

The Meridian™ ATR crystal is a 3-mm diameter hemisphere. This further focuses the incident radiation onto the sample (see Figure 2), providing an additional reduction of the source image. For such a short pathlength, diamond is virtually transparent in the useful range of the far and mid-infrared. The diamond crystal is faceted on the edge of its flat surface to provide a sampling area that is 500 μm in diameter, slightly larger than the hot spot on the crystal. This makes it easier to position small samples and maximize the clamping pressure. Because of the small size of this island, the pressure plate applies localized pressure to the sample improving contact between the sample and the crystal, allowing high contact pressures to be achieved.

For applications versatility, ZnSe, Ge, and Si crystals are also available. This selection offers a variety of sampling depths and volumes.

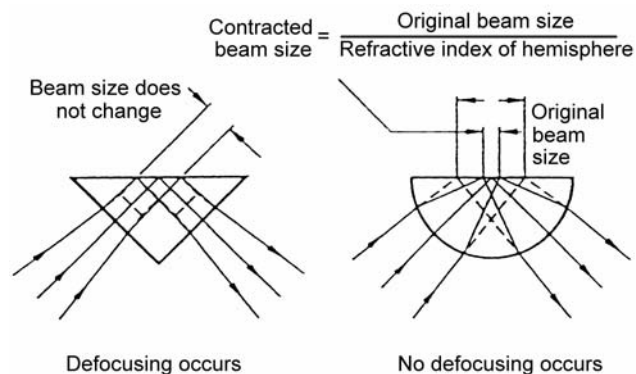


Figure 2. Focusing Effects of a Hemisphere.

The Meridian™ is available with a ViewThruPress™. This configuration is recommended for analyzing samples such as fibers, spots on transparent substrates, and powders. The ViewThruPress™ provides a 50X magnification of the sampling area and features precision adjustments for aligning the viewer over the active sampling area of the crystal. Its unique design permits the sample to be viewed as it is compressed against the crystal. The ViewThruPress™ also features an independent adjustment for focusing on the image. For liquid sampling, a flow-through liquid cell is available for use with the Meridian™. This cell is o-ring sealed and features two luer fittings.

In addition, heatable sampling plates are available for sampling at temperatures up to 200°C with the diamond or Si ATR crystals and to 100°C with a Ge ATR crystal. These sampling plates feature a gasket-sealed ATR crystal, K-type thermocouple, and 24V heater. These are designed for use with the Harrick Temperature Controller.

Representative spectra recorded with the Meridian™ are shown in Figures 3 through 6. Figure 3 shows the spectra of three different types of natural rock. These rocks are composed primarily of Lazurite ($3\text{Na}_2\text{O} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot \text{Na}_2\text{S}$),

Malachite ($\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$), and Marble (CaCO_3 or $\text{CaCO}_3 \cdot \text{MgCO}_3$). The Meridian™ readily exposes the characteristic features of these materials.

Figure 4 shows spectra from a clam shell collected from a beach on Cape Cod. The spectrum of the exterior surface has a greater contribution from the C-H and O-H bands, as would be expected from its greater exposure to the underwater plant life.

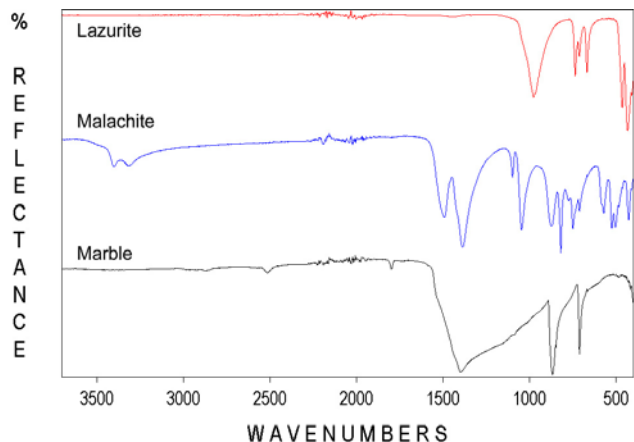


Figure 3. The ATR Spectra of Several Different Types of Rocks.

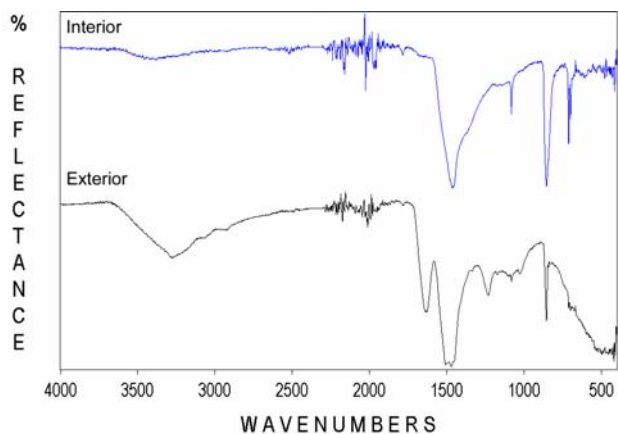


Figure 4. The ATR Spectra of the Interior and Exterior of a Weathered Clam Shell.

In addition to physically hard samples, the Meridian can be used to examine corrosive materials. Figure 5 shows the spectrum of Easy Off^{®1} Oven Cleaner, whose active ingredient is sodium hydroxide. This highly corrosive material attacks most ATR crystal materials but does not effect diamond. For this measurement, a small drop of oven cleaner was placed on the sampling surface of the diamond ATR crystal. Note that this type of sample could also be examined using the Sealed Liquid Cell (UNS-LCF) for the Meridian™.

Figures 3 through 5 illustrate the use of the Meridian™ with materials that are typically difficult to examine. The Meridian™ easily analyzes more routine samples, as

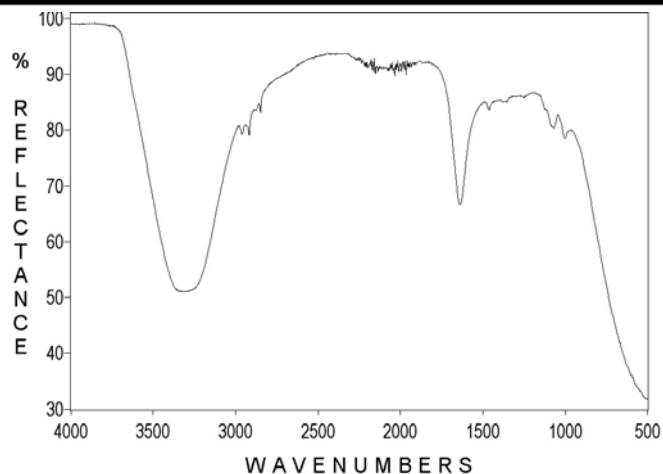


Figure 5. The ATR Spectrum of Easy Off[®] Oven Cleaner. demonstrated in Figure 6. Here, small spectral differences in the chemical composition of two waxes are evident.

As demonstrated by the above examples, the Meridian™ diamond ATR micro-sampler is a powerful tool for examining a wide range of samples, including corrosive liquids, abrasive

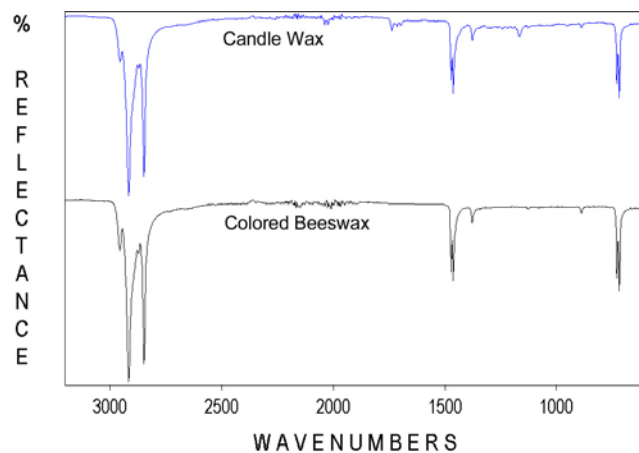


Figure 6. The ATR Spectra of Two Types of Wax. powders, and extremely hard solids in addition to those samples routinely analyzed by ATR.

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