

## FT-IR Accessories

### Attenuated Total Reflection (ATR)

An attenuated total reflection accessory operates by measuring the changes that occur in a totally internally reflected infrared beam when the beam comes into contact with a sample. An infrared beam is directed onto an optically dense crystal with a high refractive index at a certain angle greater than the critical incident angle. The resulting internal reflectance creates an evanescent wave that extends beyond the surface of the crystal into the sample held in contact with the crystal. In regions of the infrared spectrum where the sample absorbs energy, the evanescent wave will be attenuated. The altered (attenuated) energy from each evanescent wave is passed back to the IR beam, which then exits the opposite end of the crystal and is directed at the detector in the IR spectrometer. The detector records the attenuated IR beam as an interferogram signal, which can then be used to generate an infrared spectrum.

The **Smart Orbit** is a high-performance diamond single bounce ATR accessory. Diamond ATR is ideal for analysis of hard, abrasive, reactive, caustic or corrosive materials because it is both inert and extremely strong. Diamond also has a wide spectral range and good depth of penetration, which makes it a great choice for more common samples. The Smart Orbit offers additional sampling flexibility by offering optional germanium and silicon crystal plates and a 45 degree specular reflectance option. A flow cell can be added to facilitate the introduction of liquid samples to the ATR crystal element. Four different sample tips are included with the adjustable pressure tower: one short and one long pointed tip to apply high pressure to solid samples; a concave tip – for spherical solid samples; and a Teflon coated tip for powders and delicate samples such as combinatorial beads. The Lightning Viewer provides an 8X magnified view of the sample, ideal for ensuring sample placement upon the ATR crystal.

### Diffuse Reflectance (DR)

When an infrared beam is focused onto a particulate material, the incident beam can react with the particle in one of several ways. The radiation can be reflected off the top surface of a single particle or multiple particles without penetrating the particle, a process called specular reflectance. Diffuse reflectance results from the penetration of the incident radiation into one or more sample particles and subsequent scatter from the sample matrix. A diffuse reflectance accessory operates by directing the infrared energy into a sample cup filled with the neat solid powder or a mixture of the sample and an infrared transparent matrix (such as KBr). The infrared radiation then interacts with the particles causing the light to “diffuse” or scatter as it moves throughout the sample. The output mirror collects the diffusely scattered energy, which is directed to the detector in the spectrometer. The detector records the altered IR beam as an interferogram signal, which can then be used to generate a spectrum. Typically, a background is collected with the diffuse reflectance accessory in place and the cup filled with just the IR transparent matrix. Excellent quantitative data can be collected with proper sample preparation.

**Spectra-Tech Collector II** Diffuse Reflectance Accessory is designed for high sensitivity analysis and environmental studies of powder samples. The Spectra-Tech Collector II is one of the most advanced and versatile accessories for Diffuse Reflectance Infrared analysis.