

Tydex offers a wide range of Attenuated Total Reflectance (ATR) elements for total internal reflectance measurements. Typically, reflectance spectroscopy is used when samples are difficult to analyze with transmission. Overhead ATR systems are applied for gels, films and fine powder analysis. Volatile or atmosphere-sensitive samples those are difficult to handle are analysed with different top-plate ATR systems. They are also used to provide temperature sensitive analysis and polymer film migration, as well as surface orientation and reaction kinetics studies. Single reflection ATR systems are used with highly absorbing and small samples for static or flow analysis.



Tydex supplies custom ATR components in several geometries: trapezoids, parallelograms, rods, and hemispheres. Various materials are used: ZnSe, Ge, Si, and sapphire. All materials and products meet strict control standards including spectral characteristics and general performance requirements together with the specification control.

Internal reflection takes place when infrared radiation enters a material with higher refraction index and good transmission. If the angle of incidence exceeds the critical angle (eq. 1), energy is absorbed by the sample held in intimate contact with the crystal.

Eq.1 Conditions for total internal reflection

$$\alpha \geq \alpha_{\text{TIR}}, \sin \alpha_{\text{TIR}} = n_2/n_1,$$

where n_1, n_2 – refraction indices of two media.

If the systems use multiple reflection accessories, the beam of the instrument reflects again and again, and with each reflection some energy is absorbed. By the time the beam exits the crystal and reaches the detector, it contains spectral data from the sample. As a result of that, absorption spectra can be recorded.

The following factors affect the ATR spectrum:

- wavelength of incident light;
- refractive index of sample and ATR crystal;
- angle of incidence;
- efficiency of crystal-to-sample contact.

ATR crystals are made of hard enough materials with high refraction index, and the crystal is configured to allow internal reflection. The sample is held in contact with ATR-crystal and the spectrum is recorded as the superposition of the crystal transmission curve and sample absorption curve.

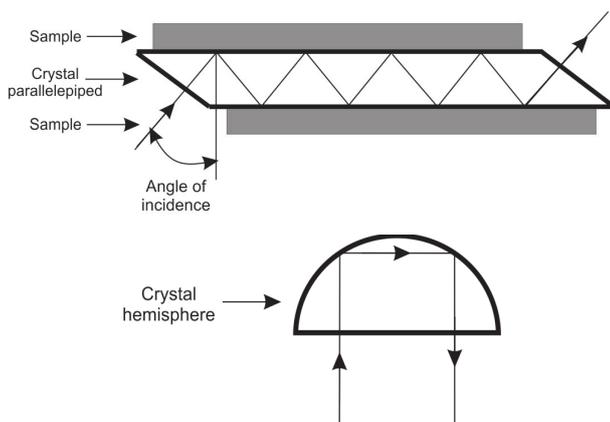


Fig.1 Light propagation through ATR elements