



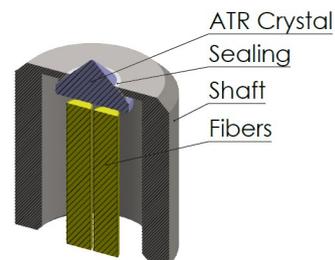
How does a fiber optic ATR-probe work?



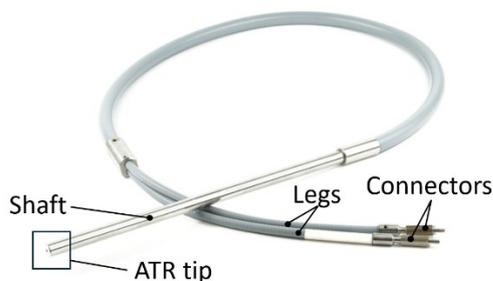
Fig. A

The ATR tip of the fiber probe consists of an ATR crystal, sealing, shaft, and optical fibers. The most used materials for the ATR probe's shaft are PEEK and the highly chemically resistant Hastelloy C22. Sealing materials are chemically resistant PEEK or PTFE or Gold. ATR crystals in fiber probes can be Diamond, Zinc Selenide, Silicon, Germanium, Zirconium Oxide or Sapphire. In the case of loop probes, a polycrystalline silver halide fiber works as the ATR element.

An Attenuated Total Reflectance (ATR) fiber optic probe is a specialized device used for spectroscopic analysis in the infrared (IR) and ultraviolet (UV) regions. ATR probes are used with FT-NIR, FT-IR, or other spectrometers. These probes transmit light from a spectrometer to the ATR crystal and back to a spectrometer, allowing real-time measurements and on-line reaction monitoring. When an ATR probe is connected to a spectrometer, an optical beam is guided through the optical fiber into the ATR crystal, where it undergoes multiple internal reflections. During these reflections, evanescent waves are generated at the crystal's surface, allowing the beam to interact with the sample in contact with the crystal. The evanescent wave penetrates only a few micrometers, so the light interacts exclusively with the sample's surface. In other words, the ATR probe must touch the sample to obtain a spectrum. This makes ATR probes suitable for analyzing liquids, gels and soft materials, such as biological tissues.



Scheme of an ATR-tip



Legs with optical fibers inside are connected to a spectrometer to guide the light through the probe

A Shaft protects internal optics and can be immersed in the sample liquid or gel

An ATR crystal at the probe tip is in contact with the sample, where the guided light interacts with a medium being analyzed

Photo of a standard ATR fiber

Connection with a spectrometer

Some spectrometers are already fiber compatible. For benchtop spectrometers an additional fiber coupler can be easily installed. The fiber coupler is an accessory for a sample compartment. It focuses the optical beam from the spectrometer into the fiber and back from the fiber into the spectrometer.

ATR probe and fiber coupler on a Fig. A are products of art photonics GmbH.

Beam path in FTIR spectrometer inside of a sampling chamber with fiber coupler (Fig. C) and without (Fig. B)

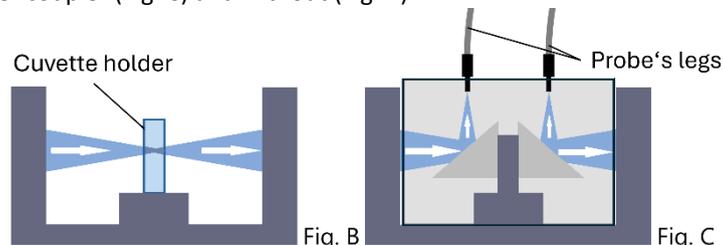


Fig. B

Fig. C

