

DialPath Sampling Accessory

A convenient way to perform transmission FTIR measurements



Introduction

The DialPath accessory for Agilent FTIR systems has been designed to overcome the challenges of transmission measurements of liquids, normally done using flow and demountable cells.

The Agilent DialPath accessory makes transmission measurements of liquids as easy as using an ATR. The accessory allows fixed pathlength transmission measurements of liquids, without requiring a conventional infrared flow or demountable cell.

Available in three preset pathlengths, the DialPath accessory enables the measurement of multiple peaks of varying intensity in the same sample in a single analysis without the need of dilution. This provides the versatility to handle both qualitative library matching and quantitative analysis on a wide range of concentrations and peak intensities.

The DialPath accessory can also be used for the measurement of polymer thin films.

Operation

Liquid samples

Conventional analysis of liquid samples requires the use of a demountable or flow cell mounted in a transmission accessory. The design of these cells makes it difficult to get reproducible pathlength after assembly. Inadequate seals in the cells can also lead to loss of sample and the introduction of air bubbles interfering with the measurement. Viscous or sticky liquids are often difficult to remove from the cells and cleaning protocols can be time consuming.

In contrast using the DialPath accessory a small drop of a liquid sample is placed on the sample window with the DialPath in the open position as shown in Figure 1.

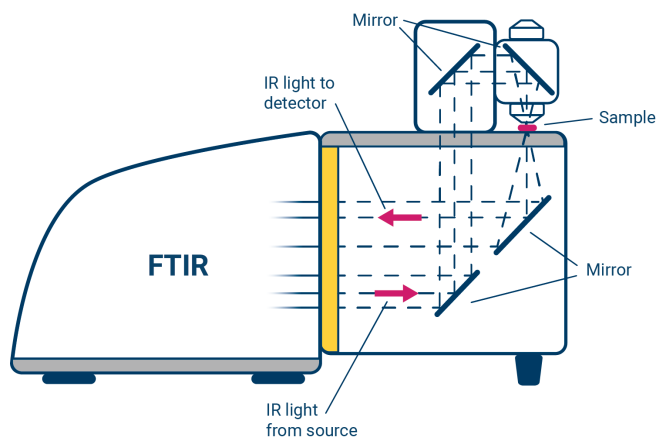


Figure 1. An optical diagram of the light path through the DialPath accessory and the Cary 630 instrument.

To make a measurement the DialPath is rotated to select the fixed pathlength required for the measurement as shown in Figure 2. After the measurement is completed the sample windows can be wiped clean and light solvent used if required. The system will validate the cleanliness of the light path prior to the next sample.

Performing measurements on multiple peaks of varying intensity on the same sample can be performed easily simply by selecting the appropriate pathlength. The fixed and repeatable pathlength measurements enabled by the DialPath make it ideal for quantitative measurements.



Figure 2. Liquid sample analysis. Three steps to analysis with the DialPath accessory.



Figure 3. The DialPath accessory can be used to measure polymer films.

Polymer films

The use of the DialPath with polymer films avoids the requirement to mount the sample for measurement in a transmission accessory. Polymer films can be measured by positioning the film on the window and rotating an appropriate pathlength into place. For non homogeneous samples there is also some flexibility to measure different parts of a larger film sample by changing the sample position. Generally for clean polymer samples no cleaning will be required between samples.

DialPath configuration options

Using ZnSe windows that are optimized for superior energy throughput, the DialPath can be used in the most humid and tropical of environments.

The DialPath accessory is available with three factory preset pathlengths:

- 30, 50, 100 μm ($\pm 0.25 \mu\text{m}$ repeatability)
- 50, 100, 200 μm ($\pm 0.25 \mu\text{m}$ repeatability)

or three custom pathlengths up to 1000 μm .

The DialPath is available as an interchangeable sampling module for the Cary 630 FTIR or as a fixed accessory on the 4500 and 5500 DialPath Compact FTIR.

FTIR measurements can be performed in the range from 5,100 to 600 cm^{-1} .

A single pathlength alternative to the DialPath accessory is the Tumbler accessory. This uses the same technology, but has a single fixed pathlength between 100 and 1000 μm .

Application examples

The use of the DialPath is used extensively throughout industry and academia in a wide range of applications. Agilent also provide application notes demonstrating the use of the DialPath and providing comparisons to other available sampling techniques. A summary of some of the currently available application notes follow. A full suite of applications can be found on the Agilent website.

Measurement of liquid samples using the Cary 630 FTIR spectrometer with DialPath accessory

This study provides a comparison of traditional transmission measurements using cell based systems, to both the DialPath and attenuated total reflectance (ATR) measurements.

The work studies some common additives found in the food, drug and cosmetic markets. Both qualitative and quantitative results are presented.

[Download the full application note.](#)

Measurement of volatile liquids

This study addresses the challenge of handling volatile samples. It demonstrates that a volatile liquid has little or no evaporation from the DialPath cell in the time period that is required to perform the measurement.

Two examples are shown to elucidate the effects of evaporation and diffusion on calibrated methods:

- Dioctyl phthalate (DOP, non-volatile analyte) in tetrahydrofuran (THF, volatile solvent).
- Benzene (highly volatile analyte) in hexane (volatile solvent)

[Download the full application note.](#)

At-site screening of adulterant levels in bovine milk

This study investigates the use of the DialPath accessory in the rapid identification of adulterants. The Agilent FTIR instruments equipped with DialPath transmission sampling technology were found to be an easy-to implement, rapid solution for screening milk samples for tampering to as low as 3% v/v dilution.

[Download the full application note.](#)

Monitoring biodiesel (FAME) content in diesel

This study discusses the use of the Agilent 4500 Series FTIR equipped with the DialPath accessory. The 4500 series FTIR is designed for portability and at-site use and uses a fixed DialPath accessory. The method developed allows trace biodiesel in marine diesel fuel to be determined quickly and reproducibly.

[Download the full application note.](#)

Determination of phenolic antioxidant DBPC and DBP in electrical insulating oil

This study demonstrates the use of the DialPath and Tumbler accessory for the determination of the two most common oxidation inhibitors. 2,6-ditertiary-butyl paracresol (DBPC) (also known as butylated hydroxytoluene (BHT)) and 2,6-ditertiary-butyl phenol (DBP) were analyzed in electrical insulating oil and mineral oil based lubricants according to the ASTM D2668 and IEC 60666 methods.

[Download the full application note.](#)

Quantification of simethicone in pharmaceutical samples

In this study, a Cary 630 FTIR with a DialPath module was used for the quantification of simethicone. For comparison purposes, data was also acquired using the traditional FTIR approach with a demountable cell in a transmission sample compartment. The data obtained with the DialPath was comparable or better to the results achieved with a traditional cell. However, the usability of the DialPath offered considerable time and cost savings compared to the use of traditional liquid cells, making it ideal for pharmaceutical applications.

[Download the full application note](#)

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DE44258.8385416667

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Printed in the USA, May 19, 2021
5994-2029EN