Traditional Omni-Cells vs the Pearl™

The Pearl™ is a much faster and more reliable spectroscopic tool than other traditional liquid analysis.

THE PEARL™ LIQUID TRANSMISSION ACCESSORY has been designed to easily and quickly record highly repeatable IR spectral measurements for a wide variety of samples with high spectral resolution.

Traditionally, a vertically mounted liquid cell, such as our Omni-cell, was used to record IR spectral measurements.

A liquid sample is contained between a pair of windows separated by a nominal thickness spacer and tightened using four quick-release nuts. This obtained a reproducible pathlength as well as a **leak-tight seal** of the constructed liquid cell during its operation.

Since the Omni-cell is placed into the beam path of the IR spectrometer in a vertical orientation, the cell needs to be leak-proof. This also means **air bubbles can form** and interrupt measurements.

This method can also consume a lot of your samples and the set-up is also time consuming. Most of the time is spent on constructing the cell with a particular pathlength.

By contrast, **the Pearl™** liquid transmission accessory contains a horizontal liquid cell called the **Oyster Cell** that closes and opens *like an Oyster!*

A common top window is placed over an interchangeable bottom window, forming the horizontal cell with the sample sandwiched in the middle with a predetermined pathlength.

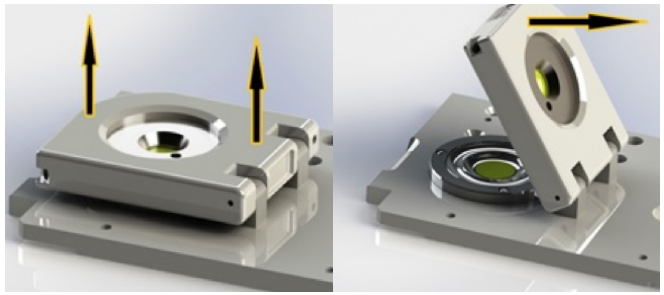

Figure 1: The mechanism of the Oyster Cell

Runny or volatile samples can be injected into the Oyster Cell via a special port near the window.

Viscous liquids and even greases can be spotted onto the lower (bottom) horizontal window surface, **prior to** the formation of the liquid cell.

The Pearl™ in-depth

The Oyster Cell bottom window is interchangeable and determines the pathlength of the Oyster Cell.

A range of different window types are available. The Pearl™ accessory comes fitted with either ZnSe or CaF_2 windows and a range of predefined pathlengths, as shown in Table 1.

The window surfaces can be parallel to each other, or they can be wedged. Parallel windows naturally produce a fringing pattern in the spectrum of an empty cell. This arises from the difference in the refractive index between the window material and the air in the cell.

Adding a sample greatly reduces the fringing pattern but it can still linger for short pathlengths.

However, the Specac Pearl™ wedged windows have a small wedge angle between them that completely **eliminates the fringing pattern**.

Pathlengths (µm)

	25	50	100	200	500	1000
ZnSe Parallel	GS31216	GS31211	GS31212	GS31213	GS31214	GS31215
ZnSe Wedged	GS31226	GS31221	GS31222	GS31223	GS31224	GS31225
CaF_2 Parallel	GS31316	GS31311	GS31312	GS31313	GS31314	GS31315
CaF_2 Wedged	GS31326	GS31311	GS31322	GS31323	GS31324	GS31325

Table 1: The Pearl™ comes fitted with either ZnSe or CaF_2 windows and a range of predefined pathlengths.

Figure 2 shows absorption spectra of Castrol Magnatec engine oil recorded using parallel and wedged ZnSe windows for a pathlength of 100 µm.

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> Wedged windows will eliminate fringing.

The fringing pattern is still present for the Oyster Cell with **parallel windows**.

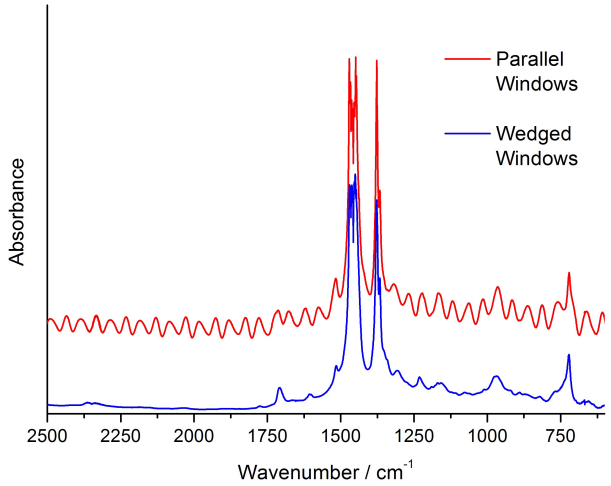

Figure 2: IR spectra of Castrol Magnatec in parallel and wedged windows.

However, no fringing is present in the **wedged windows**.

Furthermore, the wedged windows also allow for much better spectral resolution.

Comparing the two sets of spectra in Figure 2, it appears quite clear that the minor peaks at 1700, 2100 and 950 cm^{-1}, collected by wedged windows, are **more resolved** than those of the parallel windows.

Conclusions

The horizontal Oyster Cell in the Pearl™ offers a quick, reliable and simpler alternative to traditional vertically mounted liquid cells.

Gelatinous samples such as greases can't be injected into a traditional cell, meaning the user has to take it apart to analyse the sample. This wastes time, energy and money.

Therefore, the Pearl™ is the spectroscopy tool of choice because:

- **it offers accurate and repeatable pathlengths**
- **wedged windows will eliminate fringing**
- **it handles viscous materials with ease**

Did you know?

The Pearl™ can be used in a range of applications, including examining new and used service oils.

Figure 3 shows how **chemical degradation** is easily identified by IR spectra recorded using the Pearl™. What's more, **a range of pathlengths** are available to suit different uses.

For more information, please ask for our New and Used Motor/Hydraulic Oils application note or find it via the Pearl™ product page on **www.specac.com**

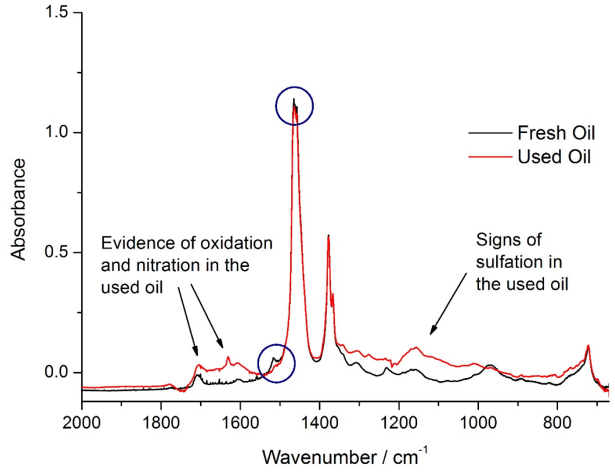

Figure 3: Used vs fresh oil spectra via the Pearl™.

We also have an application note **comparing the Pearl™ with our Quest™ ATR**. This too is available on our website or by asking our team for a copy.

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