Microliter sample volumes — exceptional sensitivity

WPI’s Liquid Waveguide Capillary Cell (LWCC) is a flow cell for absorbance measurements in the ultraviolet, visible and near infra-red ranges. Pathlengths range from 50–500 cm, with increasing measurement sensitivity from 50 to 500-fold. The flow cells are fiber coupled and have a very small sample volume ranging from 125 µL (50 cm pathlength) to 1,250 µL (500 cm pathlength).

How does it work?

The sample solution is introduced into the LWCC at the liquid input. Light is coupled into the LWCC from a light source via a fiber optic cable. After passing through the LWCC, light is collected with an optical fiber and guided to a detector. The concentration of the sample is determined by measuring its absorbance in the LWCC, similar to a standard UV/VIS spectrometer.

Advantages of LWCC over standard cuvettes

Ultra-sensitive absorbance measurements can be performed in the UV, VIS, and NIR portion of the light spectrum. Compared with a standard 1 cm cuvette, a 1 mAU signal is enhanced 100-fold to 100 mAU when using an LWCC-3100. LWCC units can be directly connected to a pump, a fluid injection analysis system, or even filled with a syringe.

Detector requirements

The LWCC couples with the TIDAS high performance fiber optic photodiode array based spectrophotometer systems, like the WPI #505067 (Tidas S300, UV/VIS 190-720 nm with deuterium and halogen lamps).

The LWCC can also couple to any CCD, PDA or scanning type optical spectrometer or photodiode detector with fiber optic input capabilities. WPI also offers a range of light sources, such as FO-6000 (VIS/NIR studies) and D4H (UV/VIS).

Wavelength range

Designed to work in the UV, VIS and NIR, the LWCC’s optical performance is strongly dependent on the solvent used in the wavelength of interest. Please note that in aqueous solutions the wavelength performance is limited (see Efficiency Curves).
Liquid Waveguide Capillary Cells

Absorbance measurements with up to 500-fold increase in sensitivity

Chemical resistance

Any chemicals that could react with PEEK, Polyimide and fused silica should not be used in LWCC. (If in doubt, please contact WPI for details.)

Applications

Applications include liquid chromatography detection, stopped-flow injection, flow-injection analysis, gas-segmented continuous flow analysis and water monitoring (environmental, oceanic, and drinking water). Please contact WPI to discuss your needs.

References


Linearity

By Beer’s Law, the absorption of a liquid sample in LWCC bears a linear relationship to the concentration of an analyte. A linear relationship is observed between 0.01–2 AU and is limited only by stray light and noise from the spectrometer.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>WAVEGUIDE MATERIAL</th>
<th>Fused silica tubing coated with a low refractive index polymer</th>
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</thead>
<tbody>
<tr>
<td>OPTICAL PATHLENGTH</td>
<td>50-500 cm</td>
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<tr>
<td>INNER DIAMETER</td>
<td>550 µm</td>
</tr>
<tr>
<td>INTERNAL VOLUME</td>
<td>≈ 125 - 1250 µL</td>
</tr>
<tr>
<td>SAMPLE INLET/OUTLET</td>
<td>COMPRESSION FITTING</td>
</tr>
<tr>
<td>FIBER INPUT</td>
<td>SMA, ID = 600 µm</td>
</tr>
<tr>
<td>MINIMUM PRESSURE</td>
<td>1.5 - 3 PSI</td>
</tr>
<tr>
<td>SOLVENT RESISTANCE</td>
<td>Most organic &amp; inorganic solvents</td>
</tr>
<tr>
<td>SHIPPING WEIGHT</td>
<td>1.4 kg (3 lb)</td>
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</tbody>
</table>

*A one-meter Type II waveguide of 550 µm ID requires about 1.5 PSI for water flow of 1 mL/min.

These spectra show the optimal detection limits for LWCCs of varying pathlength.

WORLD PRECISION INSTRUMENTS

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