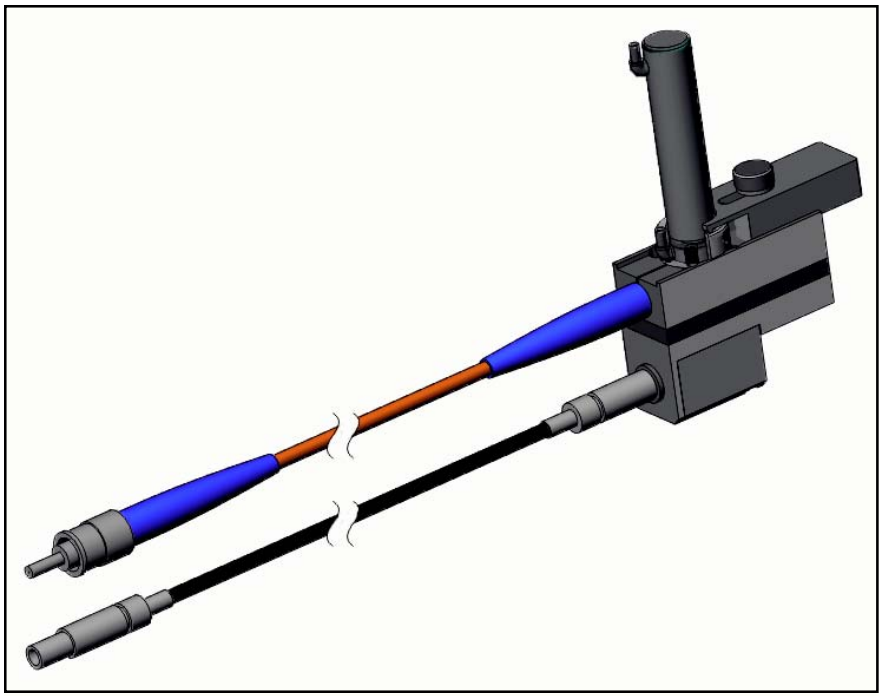
The Analyte Adapter

An Interface between the Analyte 2000™ and Polystyrene Waveguides



DESCRIPTION

The Analyte Adapter is a small opto-electronics module that serves as an interface between the Analyte 2000™ and the inexpensive, injection-molded polystyrene waveguides developed for use with the RAPTOR™ fluoroimmunoassay system. Not only does the adapter integrate the optics and electronics necessary to interrogate these waveguides, but also incorporates a sample cuvette as an element of the waveguide holder.

Installation of the adapter requires a simple factory modification of each Analyte channel, as the photodiode used for fluorescence signal detection has been mounted on the adapter and is connected electrically to the signal recovery electronics of the Analyte. However, not all channels need be modified, allowing simultaneous assays with both plastic and silica waveguides.

FEATURES

Research International has developed an optically improved, yet low-cost and manufactureable plastic waveguide in support of government biowarfare detection programs. Significant innovations have been made in waveguide design and signal generation/recovery, culminating in a streamlined and highly efficient optical system. The new evanescent wave-excited fluorescent sensor is a monolithic injection-molded polystyrene structure that is not brittle, requires no corrosive materials to process, is inexpensive, and extremely effective in terms of exciting fluorescent labels.

In operation, laser excitation light is introduced using an optical fiber from the Analyte that is embedded directly in the face of an optical filter (*see* Figure 1). This fiber has a 45° mirrored surface on its distal end that allows on-axis injection of laser light into the waveguide. The waveguide incorporates a unique aspherical dielectric cone situated at the entrance to the waveguide's cylindrical segment. Before entering the cylindrical portion of the waveguide, rays are reflected by this conical surface which has been designed to maximize excitation energy at the surface of the cylindrical portion.

Fluorescent emission light generated at the waveguide surface is transported down the fiber by total internal reflection and is then collimated by the spherical lens at the extreme left end of the element. This light passes through a long-pass spectral filter, a focusing lens, a dichroic filter, and a second focusing lens onto a photodiode. The two filters prevent stray excitation light from entering the photodiode and increasing background noise levels. The electrical signal from the photodiode is conducted back to the Analyte signal processing electronics via a small diameter coaxial cable.

To ensure accurate optical alignment, the waveguide is mounted in a holder that also serves as a sample cuvette (*see* Figure 2). A coated waveguide is placed in the cuvette and rests against an O-ring. The cuvette top is placed over the waveguide and twisted to lock in place. The entire holder is clamped into the adapter. The portion of the holder that contacts sample is manu-

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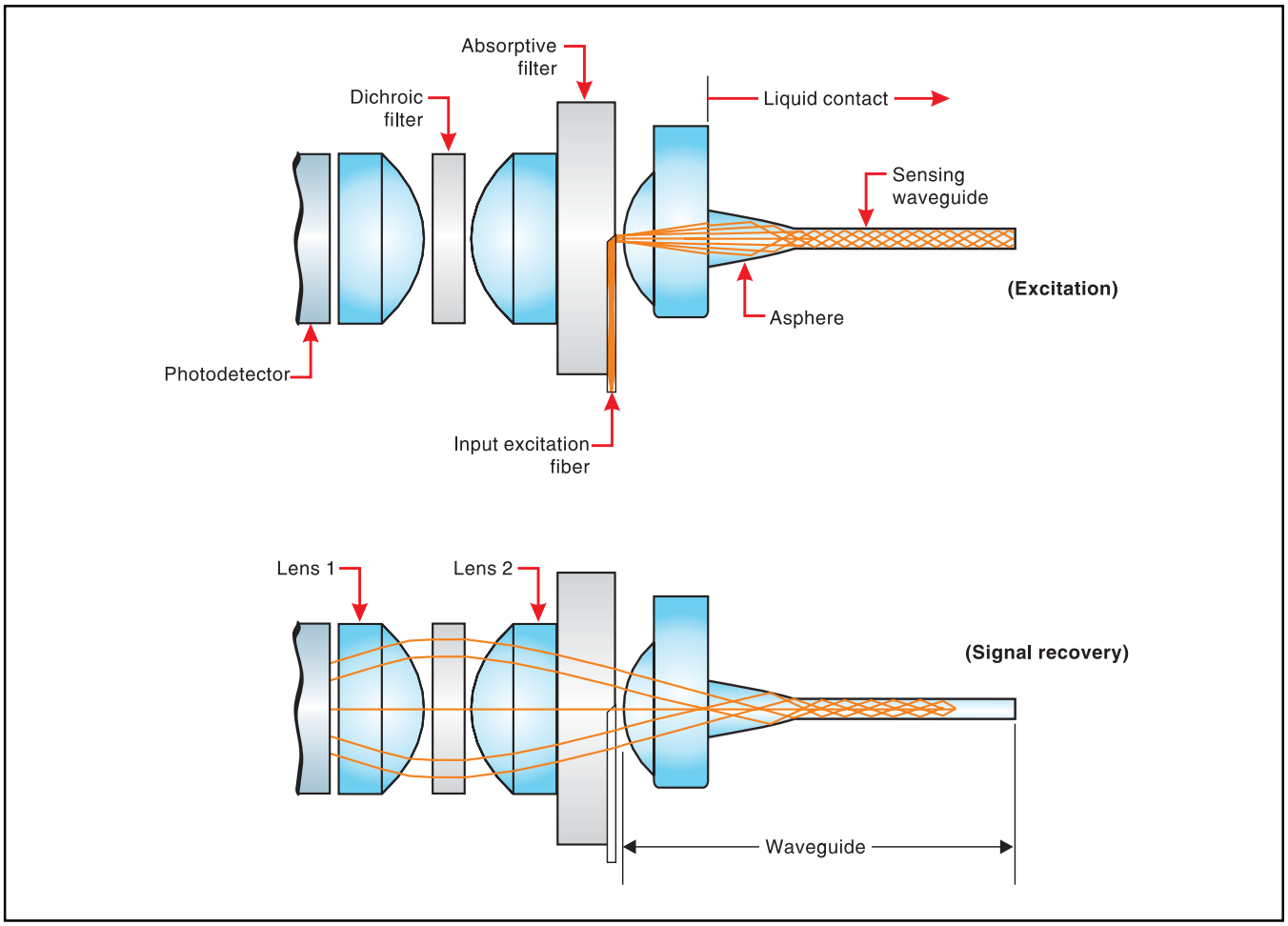

Figure 1: Operation of the Analyte Adapter.

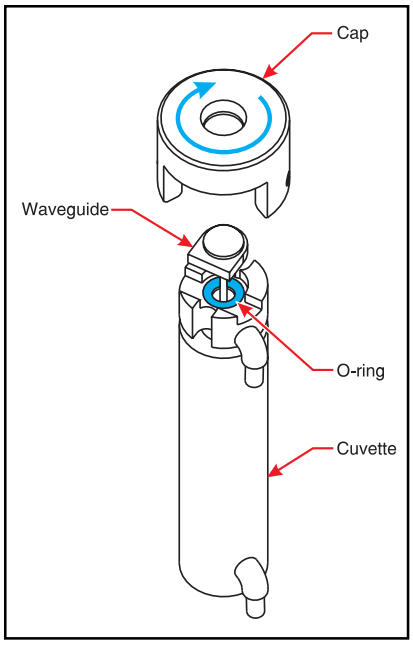

Figure 2: Waveguide holder.

factured from Delrin® and should exhibit a reasonable biocompatibility.

The polystyrene waveguides are much easier to prepare for use in immunoassays than are the original tapered silica waveguides. Proteins such as antibodies or avidin may be coated onto the sensing surface by simple adsorption, just as in preparing microtitre plates. Even without covalent binding, the coated waveguides are quite stable. Using a 'sandwich' assay format, the same waveguide may be used for repeated assays as long as the capture antibody is not saturated.

The Analyte Adapter has been constructed to provide the benefits of the plastic waveguides developed for the RAPTOR program to owners of the Analyte 2000 without requiring them to make another major capital investment.

FOR MORE INFORMATION

For further details concerning specific characteristics or applications, please contact Research International directly.

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