

# LIGHT-GUIDING FUSED SILICA CAPILLARY TUBING: A CONNECTION SCHEME

Synthetic fused silica capillary, with its outer coating of durable polyimide, has become a widely used tool in the separation sciences. In this application note, we share recently acquired data on its optical properties, with a focus on fluorescence.

BY JOE MACOMBER AND WILLIAM TUBBS

## INTRODUCTION

Light-guiding capillary with a doped inorganic cladding and a durable polyimide coating has been developed (1). This novel product allows for the axial transmission of light through the capillary. It is playing an increasing roll in applications such as sensors, real time reaction monitoring, unique sample detection and analysis, and evanescent wave based optical studies. The light-guiding capillary must be coupled to a light source and respective detector in most experimental designs. Optical fibers offer an elegant solution for this interfacing requirement. This note discusses the design and components used to connect light-guiding capillary to standard optical fibers.

## CONNECTION DESIGN

A number of companies offer fittings and connectors specifically designed to mate with standard capillary tubing products (2). These products easily meet the liquid connection demands without modification. However, making efficient, reproducible optical connections has been problematic. The simplest concept for the optical interface is to employ a fluidic "T" in which the two axial legs are respectively occupied by the light-guiding capillary and a mating optical fiber. The side leg is free to be used as a fluidic port. Traditional fittings employing polymeric tubing sleeves result in fiber to capillary spacing that is difficult to reproduce and this has led to variation in optical transmission and connection dead volume.

The introduction of connectors specifically designed for 363 $\mu$ m OD capillary offer a significant improvement in the above concept. The device shown in Figure 1 utilizes a MicroTee™ P-888 fitting (Upchurch Scientific, Oak Harbor, WA). The MicroTee was modified by drilling the existing thru-holes to an ID of 380 $\mu$ m. This allows the fiber and light-guiding capillary to be positioned for optimum optical performance. The optical fiber was FVP300330370 and the light-guiding capillary was LTSP150375 (both from Polymicro Technologies, LLC, Phoenix, AZ). TSP050375 (Polymicro) was installed into the side leg to complete the assembly.

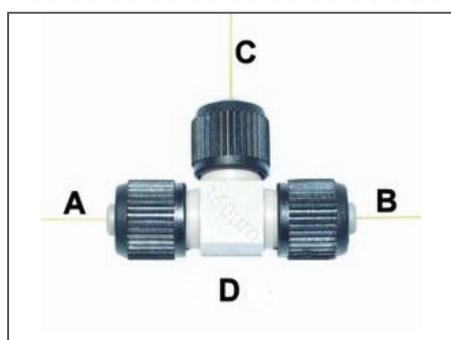


Figure 1. Light-Guiding Capillary Connector A=LTSP150375, B=FVP300330370, C=TSP050375, D=P-888

To achieve reproducible optical transmission, a spacer, such as polyimide-coated capillary, was inserted into the side leg prior to assembly of the fiber and light-guiding capillary into the MicroTee. After gently securing the fiber and light-guiding capillary, the spacer was removed and the

fittings were tightened. Proper spacing was confirmed by observation through the side leg under appropriate magnification. Any needed adjustments were made and the side leg tubing was installed. Transmission was reproducible upon repeated re-assembly. This scheme can be repeated on the opposite end of the light guiding capillary to make a flow through optical device, or can be used as described for sampling and sensing applications. For optimum light transmission, the fiber and light-guiding capillary ends should be polished to an optical finish.

## CONCLUSION

This simple connection scheme for light guiding capillary is made from readily available components and offers light guiding capillary users an improved concept for fiber optic interfacing to light sources and detectors.

## REFERENCES

- (1) Macomber, J.; Nelson, G.: "Light-guiding fused silica capillary tubing", LCGC North America (2003), (Suppl.), 58
- (2) Upchurch Scientific; Alltech Associates, Inc.; Valco Instrument Co. Inc.