High Temperature Light Guide

MARKET NEED

It is often desirable to record illumination conditions and/or images within high-temperature, hostile environments. When a technician wants to evaluate machine performance he or she might want to view the internal operation of high temperature machinery such as a furnace, engine cylinder, etc. Similarly the military might want to observe the difference between the time of first light compared with the time of first fragment impact during testing of ballistic missiles. Also, it is often desirable to transmit information optically through high-temperature interface.

However, conventional light guides are not suitable for such high temperature and hostile environments and will be destroyed (melt, suffer fiber separation, etc.) when placed in high-temperature and/or hostile environments. They are therefore incapable of withstanding such high-temperature hostile environments.

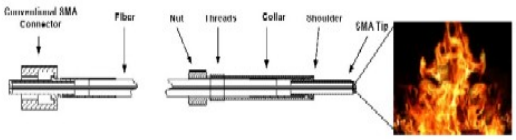

Table 1- Specifications

Optical material	Spectral Range	High Temperature Limit	Numerical Aperture
Quartz	UV-Visible	2000 °F	0.22
Borosilicate glass	Visible-Near IR	1200 °F	0.66

PRODUCT DESCRIPTION

Researchers at the Johns Hopkins Applied Physics Laboratory (APL) have created a high-temperature optical fiber assembly for sensing applications within harsh or high-temperature environments. These pressure-sealing and chemically resistant light guides have been made using both quartz and borosilicate glass. The fiber assemblies can be made to a specified length with varying bundle sizes up to 0.04 inches in diameter. Over 100 of these assemblies have been reliably produced by a commercial manufacturer and APL is currently seeking a licensing partner to bring the technology to market.

The light guides are made by bonding bundles of fine optical fibers together with high-temperature epoxy through a proprietary manufacturing process. The polished distal tip is housed within a pressure-sealing high-temperature connector that attaches to the user's threaded bulkhead with a jam nut; a shoulder provides a stop to accommodate bulkheads of varying thickness. The proximal end is fitted with a standard SMA connector (or other type) that attaches to a remote detector or spectrometer.

Office of Technology Transfer

The Johns Hopkins University APPLIED PHYSICS LABORATORY

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High Temperature Light Guide

FEATURES

- Withstands temperatures up to 1200° in Borosilicate glass and temperatures up to 2000° in Quartz
- Suitable for harsh chemical or high-temperature environments

TECHNOLOGY STATUS

Prototype

U.S. Patent Issued
7,156,559

AVAILABILITY

Available for license

For Licensing Information, contact:
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APPLICATIONS

JHU/APL has used the high-temperature light guides for measuring the optical output from high-energy explosions and for ignition and combustion monitoring within a pressurized supersonic combustor. The light-guides are uniquely suitable for use in harsh chemical or high-temperature environments for use with imagers or detectors. They may also provide diagnostic instrumentation for ignition, combustion, and other manufacturing processes. Additional applications include process monitoring in the iron-ore, steel, and aluminum processing industries, monitoring of nuclear processes, engine and turbo-machinery diagnostics, and fire detection. The high-temperature light guides can also enable the development of other types of optical sensors in harsh or high-temperature environments where conventional instrumentation cannot operate.

Cross Section of fibers in light guide

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