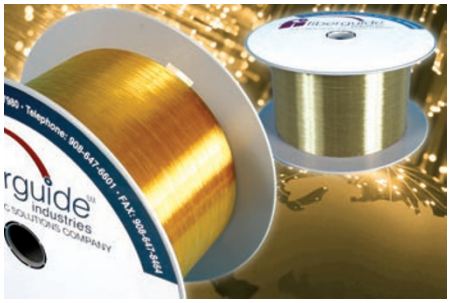
Metal-coated fibres survive harsh conditions



FIBERGUIDE INDUSTRIES

The Metal Jacket series of fibres from Fiberguide Industries are coated with gold and aluminium for high strength. The coating preserves the fibre's mechanical strength and provides resistance against failure under long-term tensile loading (known as static fatigue). The fibres can also be used at very high temperatures; the operating range is −269 °C to 400 °C for the aluminium-coated optical fibres and −269 °C to 700 °C for the tight-buffered gold-coated fibres. Both metals can be deposited onto continuous lengths of a wide variety of multimode, step-index, graded-index or single-mode fibres. Such metal-coated fibres were originally developed for ultrahigh-reliability telecommunications, but can also be used for applications such as avionics and the aerospace industry, Raman spectroscopy and distributed temperature sensing for down-hole oil and gas operations. They are resistant to chemical corrosion, opaque to radiowaves, solderable and can be sterilized through a variety of methods for application in reusable medical devices.

www.fiberguide.com

Bend insensitivity allows tight turns

ClearCurve single-mode bend-insensitive optical fibres from US firm Corning are acrylate-based and suit use at temperatures ranging from −60 °C to 150 °C. They are designed for applications in sensing and data transmission that have tight bend requirements, for example in the aerospace and defence industries, structural health monitoring and down-hole drilling. Loss at a bend radius of 5 mm is ≤0.10 dB for 1,550 nm light and ≤0.30 dB for 1,625 nm light. At an operating wavelength of 1,310 nm, attenuation is 0.5 dB and the mode-field diameter is 8.6 μm ± 0.4 μm. At 1,550 nm, attenuation is 0.4 dB and the mode-field diameter is 9.65 μm ± 0.5 μm. The cladding and coating outside diameters are 125 μm ± 1 μm and 245 μm ± 10 μm, respectively. An optional hermetic coating is available for improved protection against fatigue and hydrogen-induced attenuation.

www.corning.com

Reduced cladding suits compact spaces

Swedish firm Fibertronix has developed a line of specialty fibres with low cladding diameters of 80 μm for use in compact devices and sensors operating in harsh environments. Applications include avionics, medicine and surgery, oil and gas industries, and fibre Bragg gratings. The product range now includes standard single-mode fibre, multimode fibres and various fibres with high numerical aperture. The devices are coated with polymide, high-temperature acrylate or standard acrylate. One fibre has a numerical aperture of 0.16, a mode-field diameter of 7.8 μm ± 1 μm at a wavelength of 1,550 nm, a core/cladding concentricity error of <1 μm, a cladding non-circularity of <2% and a coating diameter of 100 μm ± 5 μm for polymide or 145 μm ± 10 μm for high-temperature acrylate. It operates in the wavelength range of 1,310–1,650 nm and exhibits an attenuation of <0.7 dB km^{-1} at 1,310 nm and <0.5 dB km^{-1} at 1,550 nm. Custom fibres with a smaller cladding of 50 μm are also available.

www.fibertronix.com

Double-clad design is free from photodarkening

CorActive in Canada has developed an ytterbium-doped double-clad fibre that has high doping concentrations and high quantum conversion efficiency. This combination of properties reduces nonlinearities and therefore allows users to minimize fibre length and pump power. The fibre has a core diameter of 6.5 μm ± 1 μm, a round cladding diameter of 128 μm ± 3 μm and a coating diameter of 260 μm ± 20 μm. It exhibits single-mode operation and high pump absorption, with a clad absorption of 0.6 dB m^{-1} ± 0.15 dB m^{-1} at 915 nm and a nominal clad absorption of 2.6 dB m^{-1} at 975 nm. The numerical apertures of the core and clad are 0.16 ± 0.02 and >0.45, respectively. Photodarkening-free performance at high power allows stable long-term operation and makes the fibre useful for applications such as light detection and ranging and second-harmonic generation.

www.coractive.com

High-efficiency fibres for lasers

Nufern in the USA has developed a family of rare-earth-doped high-efficiency fibres for operating at wavelengths of 1.5 μm and 2 μm. Er:Yb multimode double-clad fibres are intended for high-power applications at a wavelength of 1.5 μm, where the high slope efficiency results in negligible amplified spontaneous emission at 1 μm. At a nominal operating wavelength of 1,550 nm, a typical fibre in this family has a core diameter of 12 μm ± 1.5 μm, a cladding diameter of 130 μm ± 3 μm and a low-index polymer outer cladding. For the eye-safe wavelength of 2 μm — an increasingly popular wavelength for use in industrial lasers, weaponry, communication links and light detection and ranging systems — large-mode-area fibres are doped with thulium for high efficiency under pumping at a wavelength of 790 nm. One version has a core diameter of 10 μm ± 1 μm and a cladding diameter of 130 μm ± 2 μm. Another has a core diameter of 25 μm ± 2.5 μm and a cladding diameter of 400 μm ± 15 μm. The thulium-doped fibre exhibits a quantum efficiency of up to 140%. The company says that excellent beam quality is provided by the combination of high efficiency and the low-numerical-aperture core.

www.nufern.com

Strong birefringence gives stable polarization

Large-mode-area polarization-maintaining photonic-crystal fibre from NKT Photonics in Denmark incorporates a non-circular core whose large refractive index change between air and glass induces strong birefringence. This provides a short polarization beat length (<4 mm), which allows lower levels of bend-induced coupling between polarization states than those of conventional polarization-maintaining fibres. The strong birefringence also reduces the fibre's sensitivity to thermal changes. The company says that the fibre's temperature coefficient of birefringence is up to 30 times less than those of other leading stress-birefringent fibres. The polarization extinction ratio of the fibre is >20 dB over a length of 100 m. The fibre has no higher-order-mode cut-off, which provides good mode quality at all wavelengths, with the useful operating range limited only by the bend loss. Both the core and cladding are fabricated from undoped, high-purity, fused silica glass with an acrylate coating. The fibre is available in core sizes of 5 μm, 10 μm and 15 μm.

www.nktphotonics.com