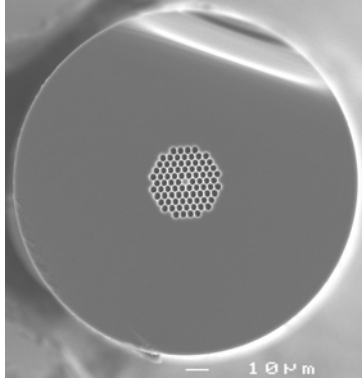


NL-3.3-890-02



Highly nonlinear PCF

Our highly nonlinear photonic crystal fibers guide light in a small solid silica core, surrounded by a microstructured cladding formed by a periodic arrangement of air holes in silica. The optical properties of the core closely resemble those of a rod of glass suspended in air, resulting in strong confinement of the light and, correspondingly, a large nonlinear coefficient. By selecting the appropriate core diameter, the zero-dispersion wavelength can be chosen over a wide range in the visible and near infrared spectrum, making these fibers particularly suited to supercontinuum generation with Ti:Sapphire or diode-pumped Nd³⁺-laser sources.

Nonlinearity: 37 W⁻¹ km⁻¹
Zero dispersion $\lambda=890$ nm
Single material
Spliceable

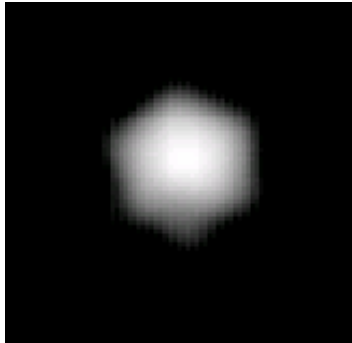
Unique properties of Highly nonlinear PCF

- Zero dispersion wavelengths from 670-880 nm available
- Nonlinear coefficients up to 190 W⁻¹km⁻¹ available (cf 1.1 W⁻¹km⁻¹ for SMF 28 at 1550 nm)
- Near-Gaussian mode profile

Applications

- Supercontinuum generation for frequency metrology, spectroscopy or optical coherence tomography
- Four-wave mixing and self-phase modulation for switching, pulse-forming and wavelength conversion applications
- Raman amplification

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Typical measured near field profile (log scale)

Optical properties

- Zero dispersion wavelength (λ_0) 890±5 nm
- Dispersion slope at λ_0 0.33 ps·nm⁻²·km⁻¹
- Attenuation

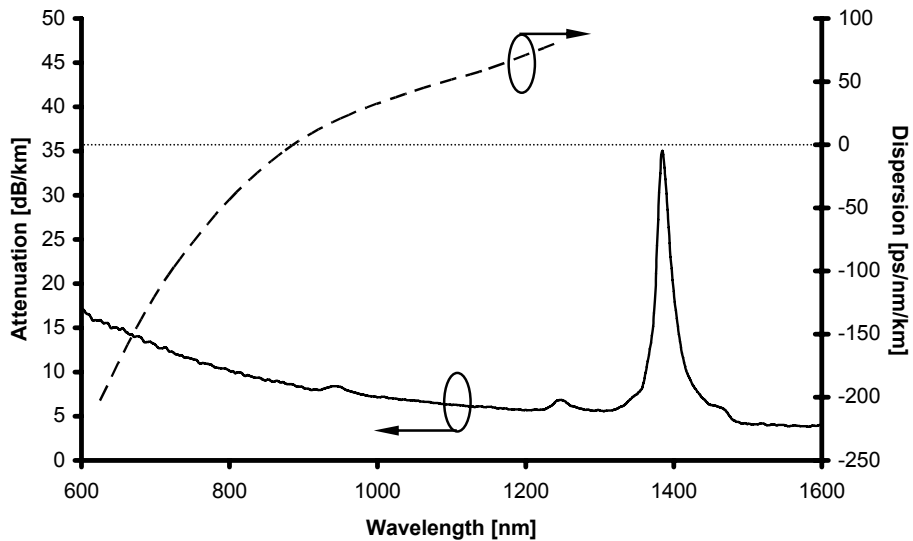
| | | |
|-------------|---|----------|
| λ_0 | < | 10 dB/km |
| 1550 nm | < | 5 dB/km |
| 1380 nm | < | 40 dB/km |
| 1000 nm | < | 10 dB/km |
| 600 nm | < | 20 dB/km |
- Mode field diameter¹ at λ_0 2.1±0.1 μ m
- Numerical aperture² at λ_0 0.35
- Effective nonlinear area³ 4.8 μ m²
- Nonlinear coefficient⁴ at λ_0 37 W⁻¹·km⁻¹

Physical properties

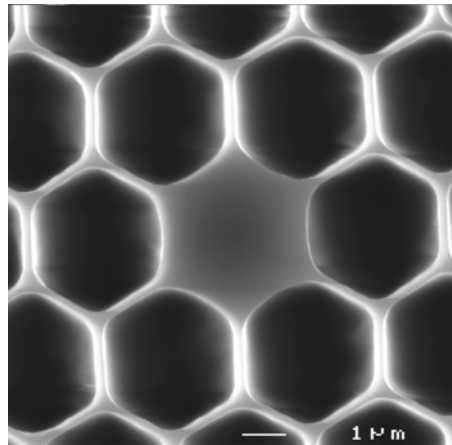
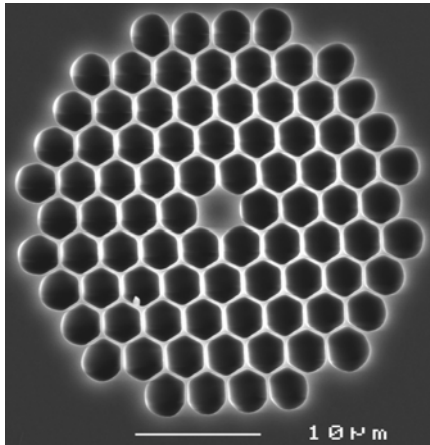
- Core diameter (average) 3.2±0.1 μ m
- Pitch (distance between cladding holes) 3.1 μ m
- Air Filling Fraction in the holey region >88%
- Width of struts holding the core 120 nm
- Diameter of holey region 32 μ m
- Diameter of outer silica cladding (OD) 154 μ m
- Coating diameter (single layer acrylate) 220 μ m
- Available length up to 1 km

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Typical attenuation spectrum and chromatic dispersion



SEM image of PCF region and core



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Notes

- 1 Full 1/e-width of the near field intensity distribution
- 2 Sine of half angle at which a Gaussian fit to the far field intensity distribution has dropped to 1% of its peak value

3

$$A_{\text{eff}} = \frac{\left(\int |\mathbf{E}(\mathbf{r})|^2 d^2\mathbf{r} \right)^2}{\int_{\text{silica}} |\mathbf{E}(\mathbf{r})|^4 d^2\mathbf{r}}$$

4

$$\gamma = \frac{2\pi n_2}{A_{\text{eff}} \lambda}$$

$n_2 \approx 2.5 \times 10^{-20} \text{ m}^2 \text{ W}^{-1}$ for silica

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