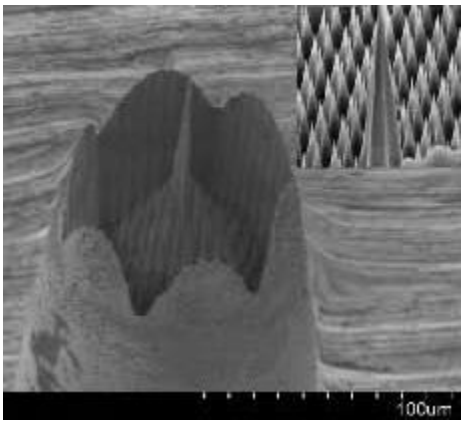
Technology Overview

Production of Fiber Optic Tips for Near-Field Microscopy
OTT ID#1117

TECHNOLOGY

Near Field Scanning Optical Microscopy (NSOM) is a widely-used technique for imaging with very high resolution. In NSOM, light is guided through a small aperture (a metal-coated optical fiber with an optical tip) and illuminates a sample that is very close to the aperture. The smaller the aperture, the higher the spatial resolution. NSOM is limited, however, by the properties of the optical fiber and the quality and geometry of the fiber tip. Many current optical fibers are doped with Germanium to achieve the refractive index necessary to guide light through the optical fiber core to the aperture. This leads to auto-fluorescence. Many fibers also transmit light only in a narrow wavelength range, necessitating the interchange of fiber "tips" for each scan with a different wavelength.



Photonic crystal fibers (PCFs) are comprised of pure silica which eliminates auto-fluorescence. In addition, the internal structure of PCFs allows for the support of a single transverse mode over a very broad spectral range enabling use at many different wavelengths. Woehl and Carlson have developed a technique for creating advanced PCF tips using a modified sealed tube etching process that leads to tips that are confined exclusively to the fiber core. With their robust production method, PCF tips are expected to have superior transmission characteristics and higher mechanical stability than typical optical tips.

The use of PCFs can also increase the flexibility of NSOM imaging systems. In contrast to typical optical fibers, PCFs maintain high peak intensities for femtosecond laser pulses. In addition, the low chromatic dispersion in PCF-based optical tips can open new possibilities for ultrafast time-resolved measurements.

FEATURES/BENEFITS

- Significantly reduced auto-fluorescence
- Endlessly single-moded over a wide wavelength range
- Low chromatic dispersion
- More accurate! Increased mechanical stability
- Potential to expand range of NSOM applications

INTELLECTUAL PROPERTY

This technology is available on an exclusive or non-exclusive basis. Additionally, functional Woehl & Carlson PCF fiber optic tips are also available through a material transfer agreement.

INVENTOR(S)

Dr. Jorg Woehl , co-inventor of the described invention, is an Assistant Professor in the Department of Chemistry and Biochemistry at University of Wisconsin-Milwaukee. Dr. Woehl is an expert in optical microscopy, PhD in Chemistry from University of California at Riverside, U.S.A. Christine Carlson, co-inventor of the technology, is a Research Assistant at UWM B.S. Biology and Chemistry and a current PhD student specialized in Single Molecule Spectroscopy and Imaging.

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