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Extended Abstract

Miniature, All-Silica, Fiber Optics Sensors Produced by Selective Etching of Phosphorus Doped Silica Glass †

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All-silica optical fiber structures created at the tip, within or along optical fibers can provide unique opportunities for a design of temperature insensitive, robust and fully dielectric micro-optical sensors as shown on Figure 1. This contribution will discuss design, manufacturing and typical performance of micro-fiber sensors created by mask-less micromachining process, which is based on a selective etching of optical fibers [1]. The proposed micromachining is accomplished through introduction of proper dopants in into designated areas of specialty structure-forming fibers. Short sections of these structure-forming optical fibers are spliced to standard or other fibers and etched into different micro-sensor devices. The prosed approach is especially useful for creation of miniature-all silica Fabry-Perot sensors [2,3], miniature micro/nanowire sensor structures, absorption microcells, and similar sensors. Furthermore, the present process allows for formation of micro-sensor structures suitable for sensing of multiple parameters. The proposed micromachining process also provides a versatile and potentially cost-efficient method of all-fiber sensor manufacturing through the design and production of specialty SFFs.

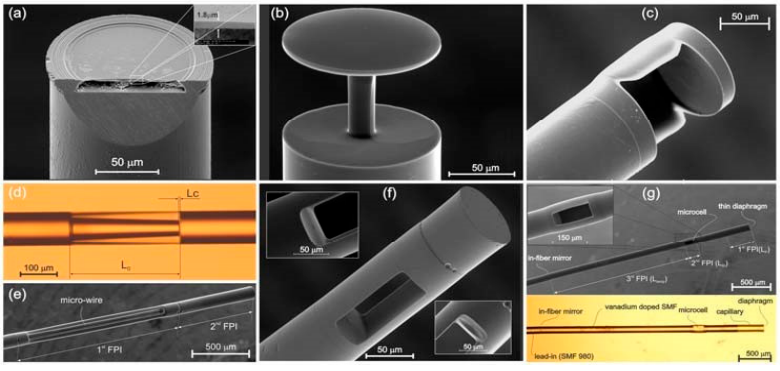

Figure 1. Micromachined sensor devices: (**a**) Pressure sensor (side polished to expose diaphragm), (**b**) Micro-resonator (**c**) Microcell on the fiber tip, (**d**) Strain sensor, (**e**) Relative humidity sensor, (**f**) Refractive index and pressure sensor, and (**g**) Four parameter sensor for sensing of: thermal conductivity, pressure, refractive index and temperature.

References

1. Pevec, S.; Cibula, E.; Lenardic, B.; Donlagic, D. Micromachining of Optical Fibers Using Selective Etching Based on Phosphorus Pentoxide Doping. *IEEE Photonics J.* **2011**, *3*, 627–632.
2. Cibula, E.; Pevec, S.; Lenardic, B.; Pinet, E.; Donlagic, D. Miniature all-glass robust pressure sensor. *Opt. Express* **2009**, *17*, 5098–5106.
3. Pevec, S.; Donlagic, D. Multiparameter fiber-optic sensor for simultaneous measurement of thermal conductivity, pressure, refractive index, and temperature. *IEEE Photonics J.* **2017**, *9*, 1–14.