



Optical fiber interferometers for precision sensing

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ABSTRACT

Interferometry is one of the most sensitive optical detection methods; it is widely used in high-resolution metrology. With optical fibers and associated fiber-optic devices, robust and versatile interferometers can be implemented. Such all-fiber interferometers have made possible the measurements of many variables in challenging conditions. In this talk, the research, advances, and novel applications of interferometric optical fiber sensors will be discussed. Instead of implementing all-optical-fiber versions of conventional interferometers, we have focused our research on new concepts and approaches to develop highly compact interferometers with specialty optical fibers. In most cases, we exploit the phase difference between two modes in photonic-crystal fibers, or between two supermodes in strongly coupled multi-core optical fibers. Microscopic interferometers built with polymer micro-cavities deposited onto the facet of a conventional telecommunications optical fiber will also be discussed. An important advantage of our interferometers is the fact that they operate at well-established telecommunications wavelengths and their interrogation can be carried out with battery-operated LEDs and inexpensive handheld spectrometers. Our efforts to develop devices that outperform state-of-the-art optical sensors in both sensitivity and functionality will be discussed. Some examples of interferometric sensors that the capability of sensing multiple parameters and that operate in real-world environments will be given.