



High sensitivity refractive index sensor based on a stack of layers at the tip of an optical fiber

Everardo Vargas-Rodriguez

Universidad de Guanajuato, Mexico

Abstract:

Refractive Index (RI) sensors are important for different bio sensing applications and there are several ways to implement them. From these fiber optical sensors are very interesting since can be miniaturized and integrated into a simple and small device. The fiber optic sensors can be based on Bragg gratings, long period gratings, interferometers and tapers. Among these the Fabry-Perot interferometer (FPI) is a very popular option since it can be fabricated in different ways at the tip of a single mode fiber, which has a diameter of 125 μm . These sensors measure the refractive index of the medium surrounding the optical fiber, which can be either gas or liquid. Therefore, it can be convenient for some applications to have the RI sensor at the tip of an optical fiber since this can be easily introduced into the sample. Moreover, typical FPI formed at the tip of the optical fiber has a reflection spectrum with fringes reaching amplitude of 4% in air, and this amplitude is varied

as the RI of the sample is changed. In this work a high sensitivity refractive index sensor based on a novel FPI, formed by a stack of 3 layers at the tip of a fiber optic, it is presented. Here, our FPI generates a reflectivity spectrum with fringes reaching amplitude up to 60%, which is considerably higher than the typically obtained with FPI formed at the optical fibers. Nominally, this increment in reflectivity helps to enhance the sensing capabilities of the sensor, particularly the resolution and the sensitivity. The sensor can measure, ideally, a refractive index from 1 to 3.4. Moreover, a resolution of around 30 dB/RIU can be achieved from the refractive index range from 1 to 1.8; this dynamic range is of interest for many bio sensing applications. Some experimental results are provided to support the modeling.

Biography:

Everardo Vargas-Rodriguez completed an M Sci in Electronics at the Universidad de Guanajuato, Mexico. Afterwards, he received a PhD in Optoelectronics at the University of Southampton of the United Kingdom in 2007. He joined the University of Guanajuato since 2007, and later he was appointed as a Director of the Department for Multidisciplinary Studies where he served from 2008-2016. Currently, he is a professor and additionally is serving as Academic Editor of the Journal of Sensors. His research interest is focused on the design of optoelectronics sensors and fiber lasers.