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Tesis: **"FIBER OPTIC FABRY-PEROT INTERFEROMETER FOR CONTACTLESS SENSING"**

Resumen:

Since the publication of the paper where the first fiber Fabry-Perot interferometer(FFPI) for sensing applications was demonstrated, more than thirty years ago, a number of configurations of this optical fiber interferometer have been proposed and used to detect physical, chemical and biological variables. Years of fruitful research activity has proven that FFPI sensors have significant advantages, such as high sensitivity, resolution, miniature size, and versatility besides the intrinsic assets of fiber optics. For refractive index sensing, FFPI sensors proposed so far have a common drawback and this is that the optical fiber has to be in direct contact with the sample or the material used as a transducer. This characteristic of the FFPI sensors is a disadvantage hard to overcome in order to fabricate, miniature, repeatable, reliable, and simple-to-use fiber sensors. This dissertation proposes and demonstrates a contactless FFPI refractometer for solid and liquid samples; providing the necessary insight to understand the operation principle of an FFPI and how this interferometer was improved by replacing the lead-in fiber with an optimized diameter tapered-down fiber tip. This FFPI structure enhancement in parallel with a custom interrogation software routine allowed to increase considerably the extrinsic FFPI air cavity to 80mm, such cavity lengths can only be achieved using beam collimating lenses. The increased size of the cavity makes it possible to introduce inside it easy-to-handle transparent glass samples, of a couple of millimeters thick, to obtain its refractive index, geometrical thickness, and the distance to the lead-in fiber tip simultaneously and in real time. The simultaneous thickness and refractive index measurements capacity of the FFPI sensor here proposed allowed us to obtain the thermo-optic coefficient and the thermal-expansion coefficient of a polydimethylsiloxane (PDMS) block, of one-centimeter-thick. Lately, PDMS is commonly used to fabricate microfluidic chips for biomedical diagnosis, point-of-care testing and biochemical detection. The proposed method also worked for liquid samples, we were able to detect different water contents in ethanol achieving a limit detection level of 0.5%. This interferometric technique can be used to develop a simple method to detect biofuels adulteration due to the presence of water.