ALL-FIBER MULTIMODE-INTERFERENCE-BASED REFRACTOMETER SENSOR: DESIGN AND CHARACTERIZATION

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MAY 2007

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ABSTRACT

ALL-FIBER MULTIMODE-INTERFERENCE-BASED REFRACTOMETER SENSOR: DESIGN AND CHARACTERIZATION

All-fiber refractometer sensor is based on multimode interference in the multimode fiber core section sandwiched between the two single-mode fibers. An eigenmode expansion method in the cylindrical coordinate is employed as the modeling tool for simulation and design of the refractometer sensor. From the design, the characterization of the refractometer can be identifying by change the length of MMF core with varying refractive indices. The refractomer design shows that it would have an estimated resolution of 5.4×10^{-5} for refractive indices from 1.38 to 1.45 through the choice of an appropriate length of the multimode fiber core section with 1550 nm of wavelength.

CHAPTER 1

INTRODUCTION

1.1 Generally introduction

Optical fibers can be developed as attractive photonic components performing desired photonic information processing or physical, chemical, or biological optical sensors for civil engineering, environment monitoring, life science and so on, through corresponding modifications such as refractive index modulation, tapering, macrobending, microbending, cladding removal or splicing different sections as shown in Figure 1.1[3].

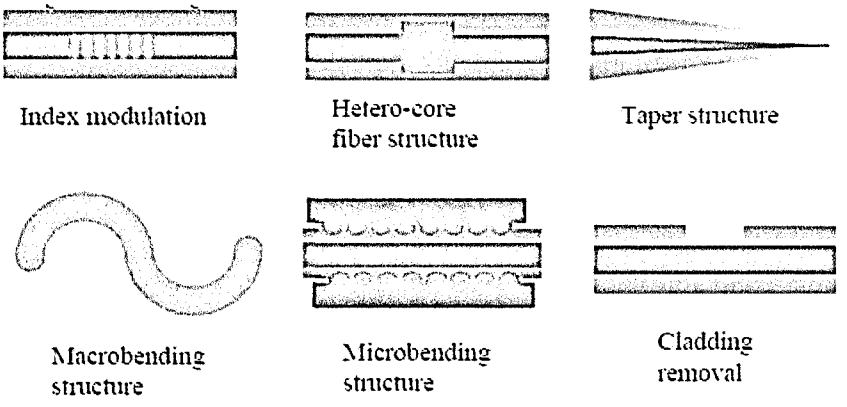

Figure 1.1: Modifications to optical fibers [3].

Many advances have been made in recent years in the use of optical fibers as sensors. Fiber optic sensors act as transducers that encode information, which describes a