Introduction to Silicon Photonics

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Abstract

The project aims to study an annular guide recorded with a Bragg grating to explore its sensing properties, such as temperature and stress, changing only geometric parameters (radius) and the core refractive index. It is proposed to develop a structure where the Bragg wavelength is insensitive to temperature changes. Therefore, simulations were made using the COMSOL software and the samples were manufactured, so the measures of the Bragg wavelength versus temperature were done and the process developed.

Key words:
Photonics, Optical Communications, Fiber Bragg Grating Sensor.

Introduction

Micro-structured photonic materials offers the potential for the propagation of light control and its interaction with matter. Understanding the origin and characteristics of the scattering processes in photonic guides is very important, both on linear and nonlinear regimes.

Results and Discussion

Before manufacturing the samples, we had to simulate the guides, using the COMSOL software. We can change geometrical parameters and refractive index in the hole to adjust the sensitivity.

In simulation, we already know the radius of the hole (the same of the available samples) and the available refractive index, so, we just need to find the ideal refractive index to each hole.

Once this was done, we went to sample preparation and then, the measurements. For measuring the reflected wavelength (Bragg wavelength) we used the experimental setup as shown in Image 1.

![Image 1. Scheme of the experimental setup.](image1.png)

Conclusions

The sample used to plot the graph shown in Image 2 is hollow, so its not filled with the correct liquid, not with the correct refractive index. We developed ways to insert the liquid with the right refractive index in the hole, so we can show that for those cases the Bragg wavelength do not change with the temperature.

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