MODAL BIREFRINGENCE OF SLOTTED SILICA WAVEGUIDE IN PHOTONIC CRYSTAL FIBER USING COMSOL MULTIPHYSICS

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ABSTRACT

MODAL BIREFRINGENCE OF THE SLOTTED SILICA WAVEGUIDE IN PHOTONIC CRYSTAL FIBER USING COMSOL MULTIPHYSICS.

The project modal birefringence of slotted silica waveguide is an investigation on the effect of the number of waveguide slabs in slotted silica waveguide with the effective index that will be produced. The large difference in effective index will produce small and compact multimode interference device. The slotted silica waveguide is rectangular in shape. The simulation was done by using the COMSOL Multiphysics software. The refractive index of silica glass used is 1.444 while the refractive index for air is 1.0. The wavelength of the light used in the simulations is 1.55μm. The value of effective index mode is taken from various number of slab in the waveguide which is 1,3,5,7, and 9. Then, the difference in effective index modal birefringence is determined. The simulation is conducted to investigate the effect of width and height of slab silica glass in the modal indices. The difference in effective indices of the modes wave is determined and compared to find the most suitable structure that give the largest modal birefringence thus producing small and compact multimode interference device.

CHAPTER 1

INTRODUCTION

1.1 Background

Today evolving telecommunication networks are increasingly focusing on flexibility and reconfigurability, which requires enhanced functionality of photonic integrated circuits (PICs) for optical communications. In addition, modern wavelength demultiplexing (WDM) systems will require signal routing and coupling devices to have large optical bandwidth and to be polarization insensitive. Also small device dimensions and improved fabrication tolerances are required in order to reduce process costs and contribute to large-scale PIC production. In recent years, there has been a growing interest in the application of multimode interference (MMI) effects in integrated optics. Optical devices based on MMI effects fulfil all of the above requirements, and their excellent properties and ease of fabrication have led to their rapid incorporation in more complex PICs such as phase diversity networks (1), Mach-Zehnder switches (2) and modulators (3) balanced coherent receivers (4) and ring lasers (5)