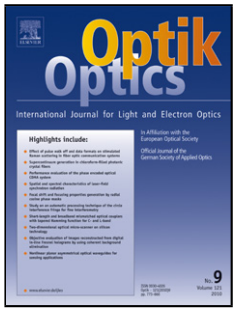

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Study of Highly Birefringence Dispersion Shifted Photonic Crystal Fiber with Asymmetrical Cladding

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Abstract: In this article we compared two models of the highly birefringent photonic crystal fiber using a full vectorial finite element method with anisotropic perfectly matched boundary layers. High birefringence and low confinement loss are successfully achieved in both fibers. The zero dispersion wavelengths are achieved for both structuresin the near infrared region. The simulation results revealed that it is possible to obtain the zero dispersion at the near infrared wavelength with low confinement loss and high birefringence by changing the structural parameters of the photonic crystal fiber. Such fibers are very useful for polarization maintaining devices, dispersion compensating devices, sensing applications and nonlinear application.

Keywords: Photonic crystal fibers, Fiber properties, Birefringence, Polarization-maintaining Fibers, Dispersion.

1. Introduction

In the past few years, photonic crystal fibers (PCFs) [1, 2] are attracted great attention of researchers. PCFs are the optical fibers with the periodic arrangement of air holes running along its length and a defect region in its center. PCFs have many unusual optical properties, such as endlessly single-mode operation [3,4], large mode area [5-7], high nonlinearity [8], high birefringence [9-11] and tailorable chromatic dispersion [12, 13] over the conventional optical fiber. Among all of them, birefringence and dispersion are the most interesting characteristics of the PCFs. Highly birefringent polarization-maintaining fibers (PMFs) are either preferred or required in many practical applications such as sensing application, polarization maintain devices, etc. By introducing asymmetry near the fiber core we can easily achieve high birefringence in PCFs. These unique properties, especially the birefringence and polarization properties can be applied in the field of communication, sensing and medical science [14-16].

For practical application of PCFs in dispersion compensation of communication system and nonlinear optics, the control of dispersion in PCFs is very important bone of contention. Modeling and simulation of different types of PCFs, such as dispersion compensating fibers [17], ultra-flattened chromatic dispersion [18-20] and polarizing maintaining fibers have been reported [21-25].

In this paper, the study of highly birefringence dispersion shifted PCF with low confinement loss is presented. All the air holes in the cladding region are kept uniformly elliptical and birefringence, confinement loss and dispersion parameters are studied by introducing two large circular air holes symmetrically located opposite side of the core. We have studied the influence