The 9th Academic Conference on Natural Science for Young Scientists, Master and PhD. Students from ASEAN Countries, 28 September - 01 October 2025, Khanh Hoa, Vietnam

NUMERICAL STUDY ON DISPERSION CHARACTERISTICS OF OCTAGONAL-LATTICE TELLURITE PHOTONIC CRYSTAL FIBERS

Hoang Trong Duc[1], Chu Van Lanh[2], Le Tran Uyen Tu[3], Nguyen Thi Oanh[4], and Nguyen Thi Thuy[1,*]

[1]*University of Education, Hue University, 34 Le Loi, Hue City, Viet Nam*

[2]*Department of Physics, Vinh University, 182 Le Duan, Vinh City, Viet Nam*

[3]*University of Science. Hue University. 77 Nguyen Hue. Hue City. Viet Nam*

[4]*Marvell Technology Viet Nam Limited Liability Company, 486 2/9 Road, Da Nang City, Viet Nam*

*E-mail: *ntthuy@hueuni.edu.vn*

Abstract. In this work, octagonal-lattice photonic crystal fibers based on tellurite glass are proposed and analyzed using the finite difference eigenmode method in the mid-infrared region. By varying the air-hole diameter in the cladding, both all-normal and anomalous dispersion profiles are achieved for wavelengths up to 6.0 µm. The dispersion properties are investigated in detail, leading to two optimized designs for supercontinuum generation. The first design, with a pitch Λ = 1.75 µm and d/Λ = 0.3, exhibits an all-normal dispersion profile, featuring a small value of –4.25 ps/(nm·km) at the pump wavelength of 2.0 µm. The second design, with Λ = 2.5 µm and d/Λ = 0.3, provides anomalous dispersion with a value of 21.024 ps/nm·km at the same pump wavelength. These fibers are promising candidates for supercontinuum generation extending into the mid-infrared wavelength range.

Keywords: *Octagonal-lattice, Tellurite glass, Photonic crystal fiber, Supercontinuum generation.*

I. INTRODUCTION

Photonic crystal fibers (PCF) is a new type of optical fiber that have been rapidly developed in the field of photonics, particularly for supercontinuum generation (SCG) in the infrared spectral region, enabling a wide range of scientific and technological applications [1].