MODELING OF NORMALIZED FREQUENCY GRADIENT FOR FUSED SINGLE MODE FIBER OF COUPLING RATIO

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Abstract:

Although the coupling ratio research has shown good progress in experimental and theoretical calculation, coupled waveguide fibers still have power reflection and power losses due to the effects of fabrication. Two fibers are coupled and heated by injecting hydrogen flow at a pressure of 1 bar with the torch flame in the range of 800-1350C. During the fusion process some optical parameters are found to vary over a wide range. A coupling coefficient is estimated from experimental results of coupling ratio distribution ranging from 1% to 75%, and a refractive index is calculated from the empirical calculation. It is found that the change of the fiber geometry affects normalized frequency even for single mode fiber.

Coupling ratio as the function of coupling coefficient and separation of fiber axis changes the normalized frequency at the coupling region. Normalized frequency is derived from the radius, wavelength and refractive index parameters. At the left and right side of the coupling region, some parameters are decreased and increased respectively. At the center of the coupling region, some optical parameters are assumed to remain constant.

The normalized frequency is integrated over the pulling length in the range of 2500-9500um for 1-D where radial and angle directions are ignored. Simulation result shows that the normalized frequency is significantly affected by the radius compared to the wavelength and refractive index of the core and cladding. This simulation has a dependence of power phenomena in transmission and reflection for communication and industrial application of coupled fibers.

Keywords: Single mode fiber, coupling ratio, coupling coefficient, normalized frequency.