# W-25, Fabrication of photonic crystal rods using multi-component glass

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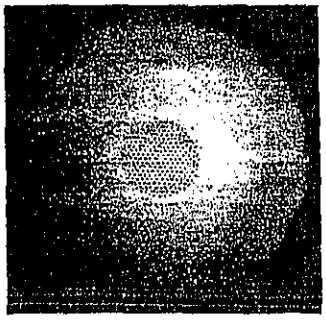
In the field of fiber optics photonic crystal fibers (PCFs) using silica glass are an attractive candidate for novel optical signal transmitting media with unique properties. So far, in this field, suppression of transmission loss of the PCFs has been of great interest for long distance optical propagation. We propose a new photonic crystal device having short optical length for a new application to optical connecting devices. We fabricated a rod type photonic crystal waveguide (PCR) using a alkali borosilicate glass, which can be strengthened by the common ion exchange process.

The preform of the PCR was fabricated by stacking glass capillaries in an outer glass tube and heating upto 725°C in vacuum. This simple method enabled self alignment of the capillaries into a dense hexagonal structure without a complicated alignment process. The preform was drawn at 830°C into a PCR having an outer diameter of 1.25mm with submicrometer accuracy. A cross sectional view of the PCR with a precise hexagonal photonic crystal structure is shown in Fig. 1. The PCR was subjected to ion exchange treatment with molten $KNO_3$. The bending strength of the PCR after the treatment reached 850MPa. The PCR exhibited single mode optical propagation with very large mode field diameter (MFD), approximately 30 micrometers, at wavelengths of both 633 and 1550nm. These characteristics of the PCR, such as accurate dimensions, large bending strength and single mode propagation with enlarged MFD, make the PCR a unique candidate for new optical connecting devices with a MFD enlargement function.



100μm

Fig. 1 cross-sectional view of PCR.