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Research of the DC discharge of He-Ne gas mixture in hollow core fiber¹ XINBING WANG, LIAN DUAN, Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology — Since the first waveguide 0.633 μm He-Ne laser from a 20 cm length of 430 μm glass capillary was reported in 1971, no smaller waveguide gas laser has ever been constructed. Recently as the development of low loss hollow core PBG fiber, it is possible to construct a He-Ne lasers based on hollow-core PBG fibers. For the small diameter of the air hole, it is necessary to do some research to obtain glow discharge in hollow core fibers. In this paper, the experimental research of DC discharge in 200 μm bore diameter hollow core fibers was reported. Stable glow discharge was obtained at various He-Ne mixtures from 4 Torr to 18Torr. In order to obtain the plasma parameter of the discharge, the trace gases of N_2 and H_2 were added to the He-Ne mixtures, the optical emission spectroscopy of the discharge was recorded by a PI 2750 spectroscopy with a CCD camera. The gas temperature (T_g) could be obtained by matching the simulated rovibronic band of the N_2 emission with the observed spectrum in the ultraviolet region. The spectral method was also used to obtain the electron density, which is based on the analysis of the wavelength profile of the 486.13nm H_β line, and the electron temperature was obtained by Boltzmann plot methods. Experimental results show that it is very difficult to achieve DC discharge in bore diameter less than 50 μm , and a RF discharge method was proposed.

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