

Er:YAG Laser Delivery System for Medical Applications

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Research Topics

- Medical applications using hollow optical fiber
- High-performance laser device
- Very thin hollow optical fiber

Research Seeds

Infrared Laser Delivery System for Medical Applications

Er:YAG laser light with 2.94 μm wavelength is gaining popularity in dental applications. Hollow optical fiber for delivering infrared laser light has been successfully developed. In dental applications for treatment of root canal, there is a critical requirement for ultra-thin infrared fiber. It is possible to shorten the treatment time by using Er:YAG laser light.

Figure 1 shows the experimental setup for Method1 silver plating in the capillary tube. The plating solution and reducing solution were forced to flow through the glass capillary. In method 1, to increase the flow rate, we made 16 bundles for 75- μm bore glass capillaries.

As presented in Fig. 1, each bundle was connected in parallel. However, because it uses 4,800 glass capillaries, it takes fabrication time and cost. Therefore, we propose method 2: four bundles of 300 pieces of silica capillaries with 75 μm inner diameter and 20 cm length were bundled. Furthermore, four bundles with 530 μm inner diameter and 50 cm length and three silica capillaries (dummy tube) with 75 μm inner diameter and 20 cm length were connected in parallel. The flow rates were, respectively, 60 and 50 ml/min for method 1 and method 2.

Losses for the 75- μm -bore size, 10-cm-length silver hollow optical fiber were 4 and 5 dB at 1 μm wavelength (excited by a Gaussian beam with FWHM=10.6°), respectively, for method 1 and method 2.

Using the dummy tube as a method of making a silver hollow optical fiber with 75 μm inner diameter, even with reduction to a quarter of the total number of the capillaries, results showed the possibility of fabricating useful ultra-thin silver hollow optical fiber.

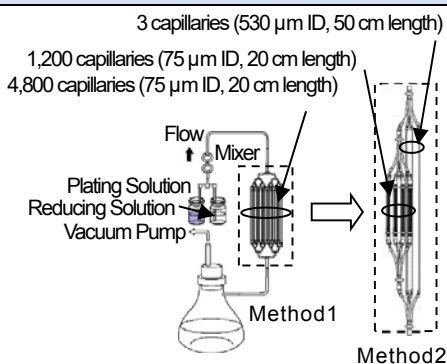


Fig. 1. Experimental Setup for Depositing a Silver layer inside the glass capillary.

Related Technology

- Fabrication of Hollow Optical Fiber
- Fabrication of High-performance Laser Tip
- Measurement of Transmission Characteristic of Hollow Optical Fiber