

내부 공진기형 2차조화파 녹색 고체 레이저

Intracavity second harmonic solid-state green laser

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Diode pumped solid-state (DPSS) lasers in the visible spectral region are efficient, compact, and robust light sources for various applications[1], such as optical data storage, material processings, spectroscopy and laser displays. Intracavity second harmonic generation (SHG) is an attractive approach for frequency doubling because the power density within the cavity is very high and, hence, high conversion efficiencies can be realized.

Many different pumping schemes have been used with DPSS lasers, but longitudinal pumping has been shown to be one of the most efficient methods, as it is possible to match the mode of the pump beam to that of a circulating beam in the cavity. In the longitudinal pumping schemes, it is essential that the heat produced in the central region of the laser material should be removed properly. We designed an end-pumped intracavity laser using Nd:YVO₄ as a laser medium and LBO as a frequency doubling crystal, as shown in Fig. 1. In order to attain a maximum green output power, two different Nd³⁺ doping ratios, three different cooling schemes for Nd:YVO₄ crystals, two different radii of curvature of the output coupler, and three different Nd:YVO₄ lengths were tried. By establishing the optimum condition for the length of LBO crystals and the value of coupling efficiency, we obtained a maximum green output of 3.71 W at a pump power of 19.6 W.

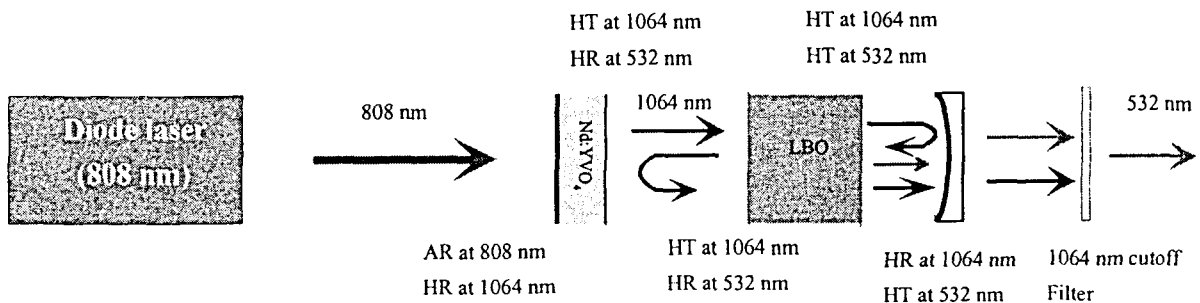


Fig. 1. A scheme for intracavity DPSS green laser.

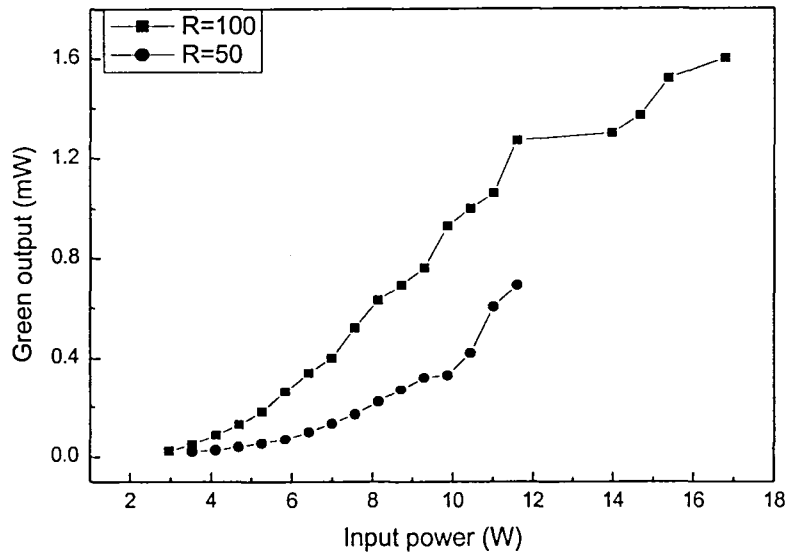


Fig. 2. Green output for two different radii of curvature of the output coupler.

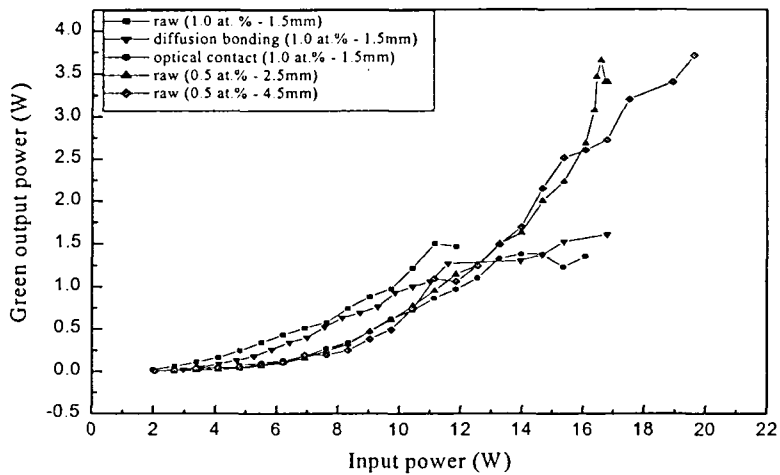


Fig. 3. Green output power using different Nd:YVO₄ cooling schemes.

Reference

1. J. J. Zayhowski and J. Harrison, "Handbook of Photonics": Chap. 8, p.326, CRC Press (1997).

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