비선형 광학 결정의 온도가 다이오드 레이저 펌핑된 내부 공진기형 Nd:YVO_4 이차 조화파 레이저의 출력 안정도에 미치는 영향

Influence of temperature of a second harmonic crystal on the power stability of intracavity frequency-doubled diode pumped Nd:YVO_4 lasers

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Intracavity second harmonic generation of diode pumped solid state lasers[1] in the visible and ultraviolet regions provide efficient, compact and robust light sources for various applications, such as optical data storage, material processing, spectroscopy and bioanalysis. Advantages of neodymium vanadate[2] (Nd:YVO_4) as a gain medium for intracavity-doubled lasers over Nd:YAG lie in the facts that the gain spectrum consists of a single line with short absorption depth, and that the stimulated emission cross sections are larger. In addition, the gain spectrum is anisotropic with respect to the crystal axes, allowing it to design a polarization-constrained laser. However, it is difficult to obtain a stable output from intracavity frequency-doubled lasers even with Nd:YVO_4, because of green problem and sensitive temperature dependence of the system, which are inherent in the intracavity second harmonic generation.

We investigated how the temperature stability of the second harmonic crystal affected the stability of the green output power of an intracavity frequency-doubled diode end-pumped laser, in which Nd:YVO_4 was used as a gain medium and LiB_3O_5 as a frequency doubling medium. The characteristic of output power was monitored as a function of temperature of the LiB_3O_5 crystal. The stability of output power was found to be very sensitive to the temperature stability of the second harmonic crystal. The conditions for stable output power were established and the maximum green output of 1.66 W was achieved at a pump power of 11.3 W (Fig. 1).

1. J. J. Zayhowski and J. Harrison, "Handbook of Photonics" : Chap. 8, 326, CRC Press (1997).
2. T. Jensen, V. G. Ostroumov, J. P. Meyn, G. Huber, A. I. Zagumennyi, I. A. Shcherbakov, Appl. Phys. B **58**, 373 (1994).

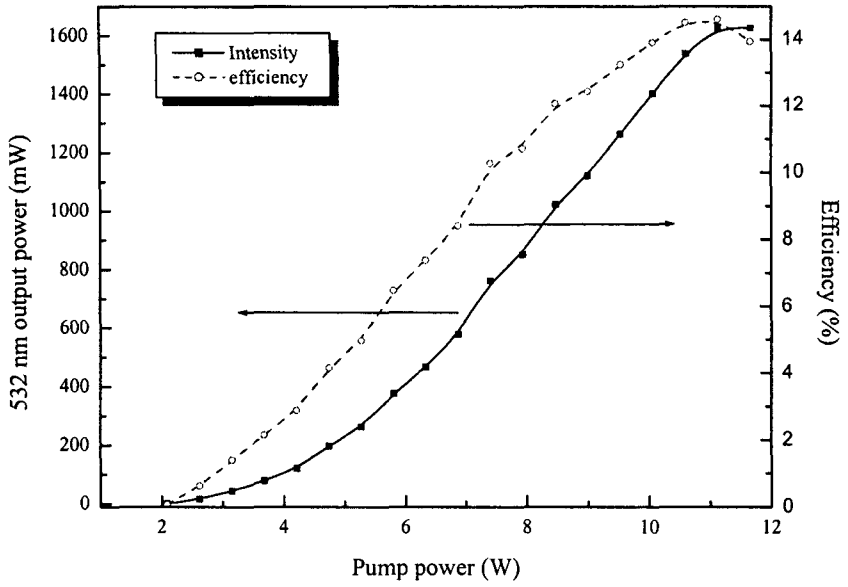

Fig. 1. Green output power and efficiency as a function of pump power.