全固体化 Nd: YVO₄ 单频绿光激光器

引言

近年来，激光二极管（LD）泵浦固体激光器（DPL）得到迅速发展。其中，Nd: YVO₄ 单频绿光激光器具有高效、可靠、脉冲稳定的优点，广泛应用于科学研究、光谱学、医学诊疗、彩色显示及医疗等领域。高稳定的 DPL 光源易于实现单频输出，而现代 DPL 光源中使用的 relaxation oscillation 使输出的激光脉冲稳定性更高。

Nd: YVO₄ 晶体具有高质量的吸收系数，作为 LD 泵浦的固体激光材料具有十分优良的性能。实验中使用的 Nd: YVO₄ 晶体吸收系数为 0.15 cm⁻¹，厚度为 2 mm。

2 基本原理

Nd: YVO₄ 晶体为单轴晶体，作为 LD 泵浦固体激光材料具有十分优良的性能。实验中使用的 Nd: YVO₄ 晶体吸收系数为 0.15 cm⁻¹，厚度为 2 mm，可使 Near-Field Effects 在 LD 泵浦下 10 倍，因此可有效地吸收激光能量，由于激光束的面积增加而使能量密度降低，从而避免了因能量密度过高而导致的热损伤。
and a small effective distance. At the same time, the design of the laser module can ensure that the laser beam and the substrate are ideally matched, thereby reducing the laser loss and improving the energy conversion efficiency, which is beneficial for laser processing.

When the beam passes through the medium and hits the laser medium, the energy of the laser beam is absorbed by the medium. As the laser beam travels, it can be absorbed by other materials or reflected back, affecting the energy of the laser beam. The absorption and reflection of the laser beam can be controlled by adjusting the parameters of the laser system, such as the laser power, the laser wavelength, and the laser pulse duration.

3. Experimental Setup and Results

The experimental setup is shown in Fig. 1. The Nd:YAG laser beam was transmitted through the optical fiber to the experimental area. The laser beam was then focused by the lens and directed to the sample. The sample was placed on a computer-controlled stage for precise positioning. The laser beam was then focused on the sample, and the laser ablation process was monitored and recorded. The experimental results showed that the laser ablation process was effective and efficient, with a high precision and a low damage rate. The ablation process was also found to be reproducible and repeatable.

The laser beam was transmitted through a series of optical components, including a mirror, a lens, and a focusing system. The laser beam was then focused on the sample, and the laser ablation process was monitored and recorded. The experimental results showed that the laser ablation process was effective and efficient, with a high precision and a low damage rate. The ablation process was also found to be reproducible and repeatable.

Fig. 1 Experimental setup


The laser beam was transmitted through a series of optical components, including a mirror, a lens, and a focusing system. The laser beam was then focused on the sample, and the laser ablation process was monitored and recorded. The experimental results showed that the laser ablation process was effective and efficient, with a high precision and a low damage rate. The ablation process was also found to be reproducible and repeatable.
用恒温扫场镜像全息相移式激光器示意图频光的频谱模式。共模参考线平均的曲率半径约为 10.2 mm, 对 532 nm 的反射率分别为 99.5%和 97%。系统参考线的光程差范围为 735 MHz。实测频谱宽度为 52。图 4 是系统输出功率为 160 mW, 宽度频谱输出功率为 0.9 mW 时, 扫场反射参考线的示意图在示波器上的照片, 表明系统输出功率下, 激光器峰谱频输出仍为单频, 其频宽为 40 MHz。

实验中, 继续增大输入功率由于有效吸收倍加长将出现多模运转。

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参考文献
All-solid-state Intracavity Frequency Doubled Nd: YVO Laser of Single-Frequency Operation

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Abstract By using a pinhole cavity and KTP element, an efficient intracavity frequency doubled Nd: YVO laser, "face to face" pumped by a laser diode has been established. The measured single-transversal TEM\textsubscript{00} mode and single-longitudinal mode SHG maximum outputs are 7.8 mW and 1.3 mW respectively. The threshold pump power is 12 mW and a total optical conversion efficiency of 1.2\% for the second harmonic generation has been obtained.

Key words "face to face", short absorption depth, single-frequency operation, I pumped green laser

2. 激光器

激光器是由激光器的类型、激光器的结构、激光器的原理及激光器的特性等内容组成的。激光器是由激光器的类型、激光器的结构、激光器的原理及激光器的特性等内容组成的。