



器件制备及器件物理

高效率LD端面抽运准连续355 nm激光器

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摘要：报道了一台激光二极管(LD)端面抽运Nd:YVO₄晶体腔内倍频和腔外和频相结合的声光调Q准连续355 nm 紫外激光器。采用LD端面抽运双侧翼键合YVO₄基质的Nd:YVO₄晶体,在腔内置入I类相位匹配的LiB₃O₅(LBO)晶体进行倍频实现1 064 nm和532 nm双波长准连续激光输出,通过消色差透镜将双波长激光聚焦耦合到II类相位匹配的LBO晶体中进行和频,并采用双向和频光路,获得了高效率、高光束质量、高重复频率的准连续355 nm 紫外激光输出。在抽运功率为28.6 W、重复频率为20 kHz时,355 nm激光最大输出功率4.2 W,脉宽为20.6 ns,光-光转换效率为14.7%,激光器光束质量因子M_x²和M_y²分别为1.29和1.23。

关键词：全固态激光器 355 nm紫外激光器 端面抽运 声光调Q 和频

本刊中的类似文章

1. 全光纤声光调Q钕镜共掺双包层光纤激光器[J]. 2008, 29(6): 1018-1022
2. 在BBO晶体中获得271—281.5nm和频输出[J]. 1993, 14(1): 49-52
3. 高效率LD端面抽运准连续355nm激光器[J]. (): 0-0

High Efficient LD End-pumped QCW 355 nm Laser

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Abstract: A laser diode (LD) end pumped acousto-optic Q-switched Nd:YVO₄ solid state 355 nm ultraviolet laser is reported by using intra-cavity double frequency and extra-cavity sum frequency technique. Nd:YVO₄ crystal bonded by YVO₄ in its both sides is end-pumped by LD, and type I phase matched LiB₃O₅ (LBO) as the second harmonic generation crystal is placed in the cavity. 1 064 nm and 532 nm dual wavelength output from the cavity are coupled into the type II phase matched LBO crystal through an achromatic lens. High efficiency, good beam quality and high repetition rate 355 nm ultraviolet laser is obtained by sum frequency mixing back and forth. The 4.2 W 355 nm laser is obtained at the pump power of 28.6 W and the repetition frequency of 20 kHz, with the pulse width as short as 20.6 ns. The optical to optical conversion efficiency is about 14.7%. The beam quality factor M_x² and M_y² of 355 nm ultraviolet laser are 1.29 and 1.23, respectively.

Keywords: diode pumped lasers 355 nm ultraviolet laser end-pumped acousto-optic Q-switched sum frequency mixing

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参考文献:

- [1] Wang J L, Yin F C, Song Z X, et al. An all-solid-state laser with high stability output power[J]. *Chin. J. Lumin.*(发光学报.2011, 32(8):830-833
- [2] Romolia L, Fischer F, Klingb R. A study on UV laser drilling of PEEK reinforced with carbon fibers[J]. *Opt. Laser Eng.*, 2012, 50(3):449-457.
- [3] Tian Z R, Liu Y F, Jin Y, et al. Fabrication of polymer distributed feedback laser by direct interference ablation[J]. *Chin. J. Lumin.*(发光学报.2012, 33(2):197-200
- [4] Yang H, Huang S, Duan J, et al. Contrastive study on laser ablation of single-crystal silicon by 1 030 nm femtosecond laser and 355 nm nanosecond laser[J]. *Chin. J. Lasers* (中国激光), 2013, 40(1):01030031-1-6 (in Chinese).
- [5] Ding X, Wang R, Zhang H, et al. Generation of 3.5 W high efficiency blue-violet laser by intracavity frequency-doubling of an all-solid-state tunable Ti:sapphire laser[J]. *Opt. Exp.*, 2008, 16(7):4582-4587.
- [6] Li B, Yao J Q, Ding X, et al. High efficiency extra-cavity frequency conversion UV laser[J]. *High Power Laser and Particle Beams* (强激光与粒子束), 2011, 23(2):290-292 (in Chinese).
- [7] Ya X, Liu Q, Gong M, et al. High-repetition-rate high-beam-quality 43 W ultraviolet laser with extra-cavity third harmonic generation[J]. *Appl. Phys. B*.2009, 95(2):323-328

- [8] Hong H, Huang L, Liu Q, *et al.* Compact high-power, TEM₀₀ acousto-optics Q-switched Nd:YVO₄ oscillator pumped at 888 nm[J]. *Appl. Opt.*, 2012, 51(3):323-327.
- [9] Jung C, Shin W, Yu B A, *et al.* Enhanced 355-nm generation using a simple method to compensate for walk-off loss[J]. *Opt. Exp.*, 2012, 20(2):941-948.
- [10] Li B, Yao J, Ding X, *et al.* High efficiency generation of 355 nm radiation by extra-cavity frequency conversion[J]. *Opt. Commun.*, 2010, 283(18):3497-3499.
- [11] Zhang B T, Huang H T, Yang J F, *et al.* Generation of 7.8 W at 355 nm from an efficient and compact intracavity frequency-tripled Nd:YAG laser[J]. *Opt. Commun.*, 2010, 283(11):2369-2372.
- [12] Lu T T, Li X L, Zang H G, *et al.* Watt level high repetition rate ultraviolet laser with La₃Ga₅SiO₁₄ electro optic Q switch[J]. *Chin. J. Lasers (中国激光)*, 2011, 38(4):04020051-1-5 (in Chinese).
- [13] Yan X, Liu Q, Chen H, *et al.* 35.1 W all-solid-state 355 nm ultraviolet laser[J]. *Laser Phys. Lett.*, 2010, 7(8):563-568.