

论文

KGW 晶体外腔式高功率579 nm喇曼黄光激光器

金辰杰^{1,2,3}, 李力飞^{1,3}, 任兆玉^{1,3}, 白晋涛^{1,2,3}, 白杨^{1,3}, 贺庆丽²

1. 西北大学 光子学与光子技术研究所暨光电技术与功能材料省部共建国家重点实验室培育基地, 西安 710069;
2. 西北大学 物理学系, 西安 710069;
3. 西北大学 陕西省全固态激光及应用工程技术研究中心, 西安 710069

摘要:

报道了579 nm高功率KGd(WO₄)₂喇曼晶体外腔式喇曼黄光激光器的输出特性.基于808 nm脉冲激光二极管侧面泵浦Nd:YAG陶瓷、腔内BBO电光晶体同步延迟调Q和I类临界相位匹配的LBO晶体腔外倍频方案,并通过外腔式KGW晶体Ng轴二阶斯托克斯喇曼频移,获得了579.54 nm黄光激光输出.当脉冲信号重复频率为1 kHz、532 nm泵浦光最高平均功率为5.02 W、脉冲宽度为10.1 ns时,获得了最高平均功率2.58 W、脉冲宽度7.4 ns、峰值功率348.6 kW的579.54 nm二阶斯托克斯喇曼黄光激光输出;532 nm至579.54 nm的光-光转化效率为51.4%、斜率效率为54.8%,光束质量因子 $M_{x-579.54}^2=5.829$ 、 $M_{y-579.54}^2=6.336$,输出功率不稳定性小于±2.35%.实验表明:外腔式喇曼结构能够高效地获得喇曼黄光,具有很高的光-光转化效率及良好的功率稳定性,并通过脉冲LD结合同步延迟电光调Q可获得高重复频率、高平均功率、窄脉冲宽度和高峰值功率的黄光激光输出.

关键词: 喇曼激光 二阶斯托克斯 KGW晶体 黄光激光器

KGW External Resonator High Power 579 nm Raman Yellow Laser

JIN Chen-jie^{1,2,3}, LI Li-fei^{1,3}, REN Zhao-yu^{1,3}, BAI Jin-tao^{1,2,3}, BAI Yang^{1,3}, HE Qing-li²

1. National Key Laboratory of Photoelectric Technology and Functional Materials (Culture Base), Institute of Photonics & Photon-Technology, Northwest University, Xi'an 710069, China;
2. Physics Department of Northwest University, Northwest University, Xi'an 710069, China;
3. Shaanxi Engineering Technology Research Center for Solid State Lasers and Application, Northwest University, Xi'an 710069, China

Abstract:

The output characteristics of 579 nm high power resonator KGd(WO₄)₂ Raman yellow laser were reported. 579.54 nm yellow laser was generated based on 808nm pulse LD side-pumped ceramic Nd:YAG, BBO electro-optical Q-switched and type-I critical phase-matching LBO crystal extracavity frequency doubling project. With the 5.02 W, 10.1 ns and 1 kHz output power pumped at 532 nm, the laser produced high average power of 2.58 W and pulses of 7.4 ns duration second-Stokes wavelength at 579.54 nm. Conversion efficiency was 51.4% and slope efficiency was 54.8%. The beam quality factors M^2 of 579.54 nm were $M_{x-579.54}^2=5.829$, $M_{y-579.54}^2=6.336$ and power instability less than ±2.35%. Experimental results indicate that external resonator Raman structure is an effective method for obtaining Raman yellow laser with its high optical-to-optical conversion and good power stability. Moreover, the additional usage of pulse LD with synchronous electro-optical Q-switch could generate high repetition rate, high average power, narrow pulse width and high peak power yellow laser.

Keywords: Raman laser Second-Stokes KGW crystal Yellow laser

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通讯作者: 白杨 (1977-),男,副教授,博士,主要研究方向为高功率光纤激光器、全固态激光器及其相关技术.Email: by@nwu.edu.cn

作者简介:

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