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激光物理与激光器件

LD端面抽运Nd：GYSGG最佳增益长度分析与实验研究

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摘要： 激光二极管（LD）端面抽运激光器存在一个最佳增益介质长度，过长或者过短的晶体都会导致激光器输出性能的降低。为了研究热致衍射损耗对最佳增益介质长度的影响，采用理论分析与实验相结合的方法，通过对晶体增益与损耗平衡理论分析计算，求解得到了Nd：GYSGG晶体的最佳增益长度为7.8mm。同时开展了对不同长度晶体的激光对比实验，证明了接近最佳增益长度的8mm晶体实验效果最佳，在脉冲抽运频率1kHz、能量约7.6mJ条件下，获得了约2.4mJ激光输出，相应的光光转化效率为31.6%。结果表明，该研究对LD端面抽运Nd：GYSGG激光器的优化设计具有参考意义。

关键词： 激光器 最佳增益介质长度 热致衍射损耗 Nd：GYSGG 端面抽运

Analysis and experiment of the optimal gain length in LD end-pumped Nd：GYSGG lasers

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Abstract: There is an optimal length of gain medium in a laser diode (LD) end-pumped laser. The laser output performance will be worsened for too long or too short crystal. In order to study the influence of thermally induced losses on the optimal gain medium length, the method of combining theoretical analysis and experiments was adopted. Through theoretical analysis of the balance between gain and losses in the laser medium, the optimal gain length of Nd:GYSGG was calculated to be 7.8mm. With experiments of laser crystals of different lengths, the best laser output performance was conformed at 8mm. The maximum output energy is about 2.4mJ with pump energy of 7.6mJ at the repetition rate of 1kHz, corresponding to the optical efficiency of 31.6%. The results show that the investigation is significant for design and optimization of end-pumped Nd:GYSGG lasers.

Keywords: lasers optimal gain medium length thermally induced losses Nd:GYSGG end-pump

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