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激光物理与激光器件

# 太阳光直接抽运激光器系统及计算机模拟优化

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摘要:

为了实现太阳光向激光的转化,设计并搭建了采用两级汇聚系统的实验系统。用菲涅耳透镜作为第1级汇聚系统,以漫反射锥型腔作为第2级汇聚系统,采用Nd:YAG作为工作物质。在太阳光的入射功率密度大约为950W/m$^2$时,实验最高可得到13.3W的功率输出。用LASCAD软件对谐振腔进行模拟,得到了晶体棒工作时的温度分布和折射率分布;通过改变参量,对系统进行优化,得到了输出功率随腔长和输出镜反射率的变化规律,找到了最佳腔长为142mm,最佳输出镜反射率为91%。结果表明,通过调整腔长和输出镜反射率的大小,找到最佳值,可有效地提高太阳光直接抽运激光器的输出功率。

关键词: 激光器 系统优化 LASCAD软件 太阳光抽运激光器

## Laser systems pumped by sunlight directly and computer simulation optimization

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Abstract:

In order to achieve the conversion from the sunlight to the laser, two-level aggregation experimental system was designed and built. By choosing a Fresnel lens as the first level of aggregation system, the diffuse reflectance tapered cavity as the second level of aggregation system and Nd:YAG as the working substance, the experimental maximum power output was 13.3W available, when the sunlight incident power was about 950W/m$^2$. In order to optimize the experimental system and improve the power output, the resonant cavity was simulated by LASCAD software. The temperature distribution and the refractive index distribution during the working of the crystal rod were obtained. The system was optimized by changing the parameters. The variation of the output power along with the cavity length and the output mirror reflectivity, the best cavity length of 142mm and the output mirror reflectivity of 91% were obtained. The results show that the output power of the laser pumped by sunlight directly can be improved effectively by adjusting the cavity length and the output mirror reflectivity and the best value can be achieved.

Keywords: lasers system optimization LASCAD software solar pumped laser

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