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器件制备及器件物理

紫外预电离放电引发的非链式脉冲DF激光器

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摘要： 采用紫外预电离的横向放电方式和稳定光学谐振腔,使用无毒无腐蚀性的六氟化硫(SF_6)和氘气(D_2)作为工作物质,研究了工作气体配比、总气压对放电引发非链式脉冲氟化氘(DF)激光器输出能量的影响。实验发现SF_6与D_2的最佳比例为10:1,最佳总气压为10.5 kPa。使用DF激光谱线分析仪对激光输出谱线进行了测量,得到了17条P支跃迁谱线,激光能量集中在3.876 μm附近的几条谱线。利用烧蚀光斑的方法测得输出激光束水平方向、垂直方向的发散角均为1 mrad。在最佳工作条件下,充电电压为39 kV时,激光单脉冲输出能量达到最大值3.58 J,此时激光脉冲宽度为215 ns,峰值功率为16.65 MW,电光转换效率为2.08%。

关键词： 脉冲DF激光器 紫外预电离 放电引发 非链式 输出特性

本刊中的类似文章

UV-preionized Electric-discharge Non-chain Pulsed DF Laser

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Abstract: Using non-toxic and non-corrosive sulfur hexafluoride (SF_6) and D_2 as working gas, the influence of the ratio and total pressure of the mixture gas on the performance of non-chain pulsed DF laser with a stable optical resonator is investigated. The research is based on UV-preionized transverse discharge method. The results show that the optimum ratio and total pressure of the SF_6 -D_2 mixture gas, are 10:1 and 10.5 kPa, respectively. By using the DF laser spectrum analyzer to measure the output spectrum of DF laser, 17 P-branch transition lines are attained, which the laser energy concentrates in several lines near the 3.876 μm line. The laser beam divergence angles in both horizontal and vertical directions are 1 mrad, which is obtained by using the laser ablation method. The maximum single pulse energy of 3.58 J, pulse duration of 215 ns, peak power of 16.65 MW, and electro-optical conversion efficiency of 2.08% are achieved under the best working conditions when the charging voltage is 39 kV.

Keywords: pulsed DF laser UV-preionized electric-discharge non-chain output characteristics

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