

飞秒激光烧蚀MgAl₂O₄透明陶瓷的实验研究

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收稿日期 2006-4-17 修回日期 2006-6-30 网络版发布日期 2007-3-10 接受日期

摘要

实验研究了800nm飞秒激光与MgAl₂O₄透明陶瓷的相互作用, 得到其在单脉冲、多脉冲情况下的损伤阈值和损伤面积, 用CCD成像技术和扫描电镜观察了烧蚀点的形貌特征, 用显微红外光谱仪测试了烧蚀区域的透过光谱. 结果表明: 单脉冲烧蚀条件下, 烧蚀面积与脉冲能量近似为线性关系, 而在多脉冲烧蚀条件下, 烧蚀面积随着脉冲数量的增加呈近似波尔兹曼(Boltzmann)增大; 当激光功率接近损伤阈值时, 烧蚀后的区域在波数为2500~7000cm⁻¹范围内的红外透过率由82%提高到86%, 当激光功率超过损伤阈值后, 透过率降低20%左右.

关键词 [飞秒激光](#) [MgAl₂O₄透明陶瓷](#) [损伤阈值](#) [红外透过率](#)

分类号 [0739](#)

Experimental Study on the Ablation of MgAl₂O₄ Transparent Ceramic by a Femtosecond Laser

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Abstract

The damage threshold and ablation area for MgAl₂O₄ transparent ceramic (MATC) by a femtosecond laser pulse at a wavelength of 800nm were studied. The ablated spots were examined by means of a charge coupled device (CCD) camera and a scanning electron microscope (SEM). The IR transmission properties of MATC machined by femtosecond laser pulses were measured by a micro-IR spectrum device. The result shows that the damaged area exhibits a linear dependence with the increase of pulse energies under the condition of a single pulse, and the area is Boltzmann distribution with the increase of the pulse number under the condition of multipule pulses. The ablated spot under optimized energy pulses (near the damage threshold energy) can improve the IR transmission from 82% to 86% in the band of 2500-7000cm⁻¹ for MATC. When the pulse energy exceeds the threshold energy, the transmission of MATC decreases rapidly by 20%.

Key words [femtosecond laser](#) [MgAl₂O₄ transparent ceramic](#) [damage threshold](#) [IR transmission](#)

DOI:

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