

论文

基于磁流体热透镜效应的阈值可调光学限幅器的理论设计

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摘要:

理论模拟了激光束通过磁流体样品后产生的远场光斑图样,提出了一种阈值可调光学限幅器的实现方案.计算了不同光阑孔径半径和不同光阑样品距离情况下,系统的出射光功率与入射光功率的关系.得出了系统的光学限幅阈值随光阑孔径半径的增大以及光阑样品距离的减小而向高功率方向转移的结论,且限幅阈值与光阑孔径半径之间呈线性关系.定义了描述磁流体样品特征的参量 f ,发现了系统的光学限幅阈值随 f 的绝对值增加而减小.本文的结论能为实际的磁流体基可调谐光学限幅器的设计与制作提供有益的参考.

关键词: 光学限幅器 热透镜 阈值可调 磁流体

Theoretical Design of Threshold-tunable Optical Limiters Based on the Thermal Lens Effect of Magnetic Fluids

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Abstract:

The far-field beam patterns after the magnetic fluid sample are simulated. The scheme for realizing the threshold-tunable optical limiters is proposed. The relationship between the output power and the incident power at several different aperture radiuses and different distances between the aperture and the sample are investigated through theoretical calculations. The results show that the threshold value of the optical limiting system shifts to high power when the aperture radiuses are increased and the distances between the aperture and the sample are decreased. The linear relationship between the threshold value and the aperture radius is obtained. The threshold value of the optical limiting system decreases with the increase of the absolute value of the magnetic fluid characteristic parameter (f). The results presented in this work may be helpful for designing the magnetic-fluid-based threshold-tunable optical limiters.

Keywords: Optical limiter Thermal lens Threshold-tunable Magnetic fluid

收稿日期 2012-02-17 修回日期 2012-03-06 网络版发布日期

DOI: 10.3788/gzxb20124109.1009




基金项目:

国家自然科学基金资助(No.10704048)和上海市教育委员会科研创新项目(No.11YZ120)资助

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