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激光技术

固体浸没透镜用于飞秒三维光存储研究

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摘要 为进一步提高光存储密度，利用固体侵没透镜（SIL）与数值孔径为0.55的长工作距离物镜对飞秒激光脉冲进行聚焦，完成了PMMA及石英介质上的存储实验，
并对聚焦物镜焦点与SIL底面离焦时的介质内焦点位置和系统的数值孔径进行了模拟。实验结果表明：当聚焦物镜焦点与SIL底面适当离焦时，实际聚焦在介质内的焦点深度不断加深，且系统的有效数值孔径不断增大。利用这一结果，在距PMMA表面20μm的地方得到了点间距1μm，层间距2.5μm的6层空间点阵；在距石英介质表面15μm的地方获得了点间距为0.6μm，层间距为2.5μm的5层空间点阵，其存储密度可达1.1×1012bits/cm3。

关键词 飞秒激光 固体浸没透镜 三维光存储
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Application of solid immersion lens to three-dimensional optical storage with femtosecond laser

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Abstract Solid immersion lens (SIL) was employed to increase the optical writing density. The position of foci and numerical aperture of the focusing system with SIL were simulated, and the three dimensional optical data storage was conducted. The simulation result shows that the depth actually focused into the media is increased and the effective numerical aperture is enlarged with the suitable off-focus distance between the foci of focusing objectives and the bottom plane of SIL. With this result, a SIL with n=1.55 was positioned under a 0.55 NA micro objective to focus a 150 fs Ti:sapphire pulse laser at 800nm, and a 5-layer reading and writing of data were achieved with 2.5mm separation between two layers and 0.6 mm separation between two bits. Accordingly, the storage density of 1.1×1012 bit/cm3 was obtained in this way.

Key words femtosecond pulse laser solid immersion lens three-dimensional optical storage

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