光学精密工程 » 2015, **Vol. 23** » Issue (7): 1978-1983 DOI: 10.3788/OPE.20152307.1978

宽波段全息–离子束刻蚀光栅的设计及工艺

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Design and fabrication of broadband holographic ion beam etching gratings

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摘要 图/表 参考文献 相关文章 (15)

全文: PDF (1553 KB) RICH HTML NEW

输出: BibTeX | EndNote (RIS)

摘要 设计和制作了一种在同一基底上具有多闪耀角的宽波段全息-离子束刻蚀光栅。提出了组合形成宽波段全息-离子束刻蚀光栅的分区设计方法,优化了3种闪耀角混合的宽波段全息光栅设计参数,并利用反应离子束刻蚀装置对该光刻胶掩模进行刻蚀图形转移,采用分段、分步离子束刻蚀技术开展了获得不同闪耀角的离子束刻蚀实验。最后在同一光栅基底上分区制作了位相相同,并具有9,18,29° 3个不同闪耀角,口径为60 mm×60 mm,使用波段为200~900 nm的宽波段全息光栅。衍射效率测试结果显示其在使用波段的最低衍射效率超过30%,最高衍射效率超过50%,实验结果与理论计算结果基本符合。 与其它方式制作的宽波段光栅相比,采用宽波段全息-离子束刻蚀光栅不但工艺成熟,易于控制光栅槽形,而且光栅有效面积尺寸较大,便于批量复制。

关键词 : 全息光栅, 宽波段光栅, 离子束刻蚀, 刻蚀模拟

Abstract : A broadband holographic ion beam etching grating with three different blazed angles was designed and fabricated on the same substrate. A new divisional design method for the broadband holographic ion beam etching grating was proposed and the design parameters for the grating were optimized. A reactive ion beam etching equipment was used in the pattern transfer of photosensitive resist and the divided and stepped ion beam etching technology was used in the experiment. Finally, a broadband holographic ion beam etching grating with a diameter of 60 mm×60 mm worked at 200-900 nm was fabricated on a K9 substrate, which has the same phase but three different blazed angles of 9°,18° and 29° on different areas. The experimental results show that the lowest and the highest diffraction efficiencies of holographic ion beam etching grating are higher than 30% and 50%, respectively in the broadband of 200-900 nm, which is well in agreements with that of the theoretical calculation and meets the design requirements. As compared with other fabricating methods for grating, the proposed method is characterized by controllable groove shapes, larger sizes and to be easy for bulk fabrication.

Key words : holographic grating broadband grating ion beam etching etching simulation

收稿日期: 2015-01-07

中图分类号: O436.1

基金资助:国家重大科学仪器设备开发专项资助项目(No.2011YQ120023)

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引用本文:

吴娜, 谭鑫, 于海利, 张方程. 宽波段全息-离子束刻蚀光栅的设计及工艺[J]. 光学精密工程, 2015, 23(7): 1978-1983. WU Na, TAN Xin, YU Hai-li, ZHANG Fang-cheng. Design and fabrication of broadband holographic ion beam etching gratings. Editorial Office of Optics and Precision Engineering, 2015, 23(7): 1978-1983.

链接本文:

http://www.eope.net/CN/10.3788/OPE.20152307.1978 **或** http://www.eope.net/CN/Y2015/V23/I7/1978