华东师范大学学报(自然科学版)
JOURNAL OF EAST CHINA NORMAL UNIVERSITY NATURAL SCIENCES

华东师范大学学报(自然科学版) » 2012, Vol. 2012 » Issue (5): 10-15 DOI:

飞秒激光在对氨基偶氮苯薄膜表面上制备微偏振元件

彭雪影， 贾天卿， 孙真荣

华东师范大学 精密光谱科学与技术国家重点实验室，上海 200062

Micopolarization elements on p-aminoazobenzene film induced by femtosecond laser pulses

PENG Xue-ying, JIA Tian-qing, SUN Zhen-rong

State Key Laboratory of Precision Spectroscopy, East China Normal University, Shanghai 200062, China

- 摘要
- 参考文献
- 相关文章

全文: PDF (1860 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 用400 nm和800 nm线偏振飞秒激光垂直聚焦于对氨基偶氮苯薄膜表面上，以形成纳米微结构.实验观察到 400 nm 和800 nm线偏光照射样品表面分别得到周期为210 nm和500 nm的干涉条纹，条纹周期均随激光能流密度的增强而增大.通常认为这种周期结构是由入射激光与材料表面的散射光相干涉所形成的：光的干涉引起材料表面温度呈现梯度变化，从而引起表面张力呈现梯度变化，诱导周期条纹的产生.制备偶氮聚合物的厚膜，用400 nm飞秒激光照射样品表面，同样也得到周期性纳米微结构.

关键词： 光学材料 飞秒激光 对氨基偶氮苯 微偏振元件 周期结构

Abstract: Fabrication of nanostructures on a surface of p-aminoazobenzene polymer film illuminated by 400 nm and 800 nm femtosecond laser was studied. Ripples with periods of 210 nm and 500 nm were produced by linearly polarized 400 nm and 800 nm femtosecond laser pulses, respectively. The periods of the ripples increase with increasing the intensity of incident laser pulses. The interference of this diffracted optical wave with the incident beam gives rise to optical interference ripples. Gradient of surface tension is induced by the surface temperature gradient caused by the interfered light. The gradient of surface tension gives rise to the periodical ripple structures. Thick polymer film was made and illuminated by 400 nm femtosecond laser, and periodic nanostructures were also been observed.

Key words: optical material femtosecond laser p-aminoazobenzene micopolarization elements periodic nanostructures

收稿日期: 2011-11-01; 出版日期: 2012-09-01

服务
把本文推荐给朋友
加入我的书架
加入引用管理器
E-mail Alert
RSS
作者相关文章

引用本文:

. 飞秒激光在对氨基偶氮苯薄膜表面上制备微偏振元件[J]. 华东师范大学学报(自然科学版), 2012, 2012(5): 10-15.

. Micopolarization elements on p-aminoazobenzene film induced by femtosecond laser pulses[J]. Journal of East China Normal University(Natural Sc, 2012, 2012(5): 10-15.

[1] BIRNBAUM M. Semiconductor surface damage produced by ruby laser[J]. J Appl Phys, 1965, 36: 3688.

[2] HENYK M, VOGEL N, WOLFF RAMM D. Femtosecond laser ablation from dielectric materials: Comparison to arc discharge erosion[J]. Appl Phys A, 1999, 69(Suppl): S355-S358.

[3] COSTACHE F, HENYK M, REIF J. Surface patterning on insulators upon femtosecond laser ablation[J]. Appl Surf Sci, 2003, 208-209: 486-491.

[4] BOLLE M, LAZARE S. Characterization of submicrometer periodic structures produced on polymer surfaces with low fluence ultraviolet laser radiation[J]. J Appl Phys, 1993, 73: 3516-3524.

[5] SENDOVA M, HIRAOKA H. Sub-half-micron periodic structures on polymer surfaces with polarized laser irradiation[J]. Jpn J Appl Phys, 1993,

32: 6182-6184.

[6] HIRAOKA H, SENDOVA M. Laser-induced sub-half-micrometer periodic structure on polymer surfaces[J]. Appl Phys Lett, 1994, 64: 563-565.

[7] CSETE M, MARTI O, BOR Z. Laser-induced periodic surface structures on different-poly-carbonate films[J]. Appl Phys A Mater, 2001, 73: 521-526.

[8] DYER P E, FARLEY R J. Periodic surface structures in the excimer laser ablative etching of polymers [J]. Appl Phys Lett, 1990, 57: 765-767.

[9] 吴晓君,贾天卿,赵福利,等.飞秒激光在6H SiC晶体表面制备纳米微结构[J]. 光学学报, 2007, 27(1): 105-110.

[10] ISENOR N R. CO 2 laser-produced ripple patterns on Ni x P 1- x surfaces [J]. Appl Phys Lett, 1977, 31(3): 148-150.

[11] GATTASS R R, MAZUR E. Femtosecond laser micromachining in transparent materials[J]. Nature Photonics, 2008, 2(4): 219-225.

[12] BERESNA M, KAZANSKY P G. Polarization diffraction grating produced by femtosecond laser nanostructuring in glass [J]. Optics Letters, 2010, 35: 1662-1664.

[13] FU B, LI S G, YAO Y Y, et al. Supercontinuum generation with high birefringence SF6 soft glass photonic crystal fibers [J]. Chinese Physics Letters, 2010, 27(7): 074209.

[14] CIMROV V, NEHER D, HILDEBRANDT R, et al. Comparison of the birefringence in an azobenzene-side-chain copolymer induced by pulsed and continuous-wave irradiation [J]. Appl Phys Lett, 2002, 81(7): 1228-1230.

[15] GAN F X, HOU L S, WANG G B, et al. Optical and recording properties of short wavelength optical storage materials [J]. Materials Science and Engineering, 2000, B76: 63-68.

[16] 王光斌,李晶,候立松,等.偶氮染料掺杂高分子PMMA薄膜的光学参数[J].光子学报, 2000, 20(4): 565-569.

[17] TODOROV T, NIKOLOVA L, TOMOVA N. Polarization holography. 1: A new high-efficiency organic material with reversible photoinduced birefringence[J]. Optical Society of America, 1984, 23: 4309-4312.

[18] BOLLE M, LAZARE S. Characterization of submicrometer periodic structures produced on polymer surfaces with low-fluence ultraviolet laser radiation [J]. J Appl Phys, 1993, 73: 3516-3524.

[19] TSUTSUMI N, FUJIHARA A. Pulsed laser induced spontaneous gratings on a surface of azobenzene polymer [J]. Applied Physics Letters, 2004, 85: 4582-4584.

[20] TSUTSUMI N, FUJIHARA A. Self-assembled spontaneous structures induced by a pulsed laser on a surface of azobenzene polymer film[J]. J Appl Phys, 2007, 101: 033110.