液晶与显示
中文核心期刊
Chinese Journal of Liquid Crystals and Displays
主管：中国科学院
主办：中国科学院长春光学精密机械与物理研究所
中国物理学会液晶分会
中国光学光电子行业协会液晶分会
主编：郭海成

液晶与显示 2011, 26(2) 137-141 ISSN: CN:

材料物理和化学

Berreman近似下任意形状表面沟槽对双轴向列相方位锚定的影响

郑桂丽, 李根堂, 张志东

河北工业大学 理学院,天津 300401

摘要： 通过把Berreman近似下任意形状的 表面沟槽用傅里叶级数展开,写成正弦函数和的形式,将Fukuda 等人的理论应用于双轴向列相液晶中,考虑表面弹性项的作用后得到了任意形状的沟槽对双轴液晶产生的方位锚定能。在一定的近似条件下得到约化锚定能随着沟槽的方向与液晶主指向矢之间的夹角的变化情况,讨论了双轴弹性常数对液晶易取向方向的影响。

关键词： 双轴向列相液晶 沟槽 傅里叶级数 锚定能

Effect of Grooved Surface with Arbitrary Shape on Anchoring Energy of Biaxial Nematic Liquid Crystal

ZHENG Gui-li, LI Gen-tang, ZHANG Zhi-dong

School of Sciences, Hebei University of Technology, Tianjin 300401, China

Abstract: Under the approximation of Berreman, any grooved surface with arbitrary shape can be described in terms of Fourier series. Based on the theory of Fukuda et al, the expression of anchoring energy with an additional term was obtained, taking into the surfacelike elastic term in biaxial nematic liquid crystal. The figures of reduced anchoring energies versus the angle between the direction of the grooves and main director were simulated under the different values of surfacelike elastic constant in certain cases and the effect of biaxial elastic constant on easy axes was discussed.

Keywords: biaxial nematic liquid crystal groove Fourier series anchoring energy

收稿日期 2010-07-13 修回日期 2010-08-18 网络版发布日期 2011-04-06

基金项目:

国家自然科学基金(No.60736042);河北省自然科学基金(No.A2010000004);河北省重点学科资助项目

通讯作者:

作者简介: 作者简介: 郑桂丽(1981-),女,河北唐山人,硕士,从事液晶物理方向的研究。

作者Email: zhengguili@hebut.edu.cn

参考文献：

[1] Berreman D W. Solid surface shape and alignment of an adjacent nematic liquid crystal [J]. *Phys. Rev. Lett.,* 1972, 28(26):1683-1686. [2] Gwag J S, Oh-e M, Yoneya M, *et al.* Advanced nanoimprint lithography using a grade functional imprinting material tailored for liquid crystal alignment [J]. *J. Appl. Phys.,* 2007, 102(6):063501(1-5). [3] Kawata Y, Takatoch K, Hasegawa M, *et al.* The alignment of nematic liquid crystals on photolithographic micro-groove patterns [J]. *Liq. Cryst.,* 1994, 16 (6):1027-1036. [4] Park M J, Park O O. Alignment of liquid crystals on a topographically nano-patterned polymer surface prepared by a soft-imprint technique [J]. *Microelectronic Engineering,* 2008, 85(11):2261-2265. [5] Fukuda J I, Yoneya M, Yokoyama H. Surface-groove-induced azimuthal anchoring of a nematic liquid crystal:Berreman s model reexamined [J]. *Phys. Rev. Lett.,* 2007, 98(18):187803(1-4). [6] Fukuda J I, Yoneya M, Yokoyama H. Erratum:Surface-groove-induced azimuthal anchoring of a nematic liquid crystal:berreman s model reexamined [J]. *Phys. Rev. Lett.,* 2007, 99(13):139902(1-2). [7] Fukuda J I, Gwag J S, Yoneya M, *et al*. Theory of anchoring on a two-dimensionally grooved surface [J]. *Phys. Rev. E.,* 2008, 77(1):011702(1-16). [8] Madsen L A, Dingemans T J, Nakata M, *et al*. Thermotropic biaxial nematic liquid crystals [J]. *Phys. Rev. Lett.,* 2004, 92(14):145505(1-4). [9] Acharya B R, Primak A, Kumar S. Biaxial nematic phase in bent-core thermotropic mesogens [J]. *Phys. Rev. Lett.,* 2004, 92(14):145506(1-4). [10] Merkel K, Kocot A, Vij J K, *et al*. Thermotropic biaxial nematic phase in liquid crystalline organo-siloxane tetrapodes [J]. *Phys. Rev. Lett.,* 2004, 93(23):237801(1-4). [11] Saupe A. Elastic and flow properties of biaxial nematics [J]. *J.Chem. Phys.,* 1981, 75(10):5118-5124. [12] Singh Y, Rajesh K, Menon V J. *et al*. Molecular theory of elastic constants of liquid crystals. II. Application to the biaxial nematic phase [J]. *Phys. Rev. E.,* 1994, 49 (1):501-512. [13] Zhidong Zhang, Wengjiang Ye. The elastic distortion and stability of biaxial nematic liquid crystal on the surface grooves [J]. *Liq. Cryst.,* 2009, 36(8):885-888.

本刊中的类似文章

1. 李峥, 刘红.弹性键相连的双矩形板液晶分子系统的相变[J]. 液晶与显示, 2011,26(6): 711-718
2. 张志东;叶文江;张 鹭.表面沟槽诱导双轴向列相液晶的弹性畸变[J]. 液晶与显示, 2010,25(1): 1-4
3. 苑梦尧;邓罗根.液晶盒边界效应对胆甾相液晶电控螺距的影响[J]. 液晶与显示, 2010,25(1): 21-28
4. 张 凯;杜 鑫;李 儒;阎 斌;汪映寒.表面活性剂对聚合物分散液晶光电性能的影响[J]. 液晶与显示, 2010,25(1): 49-52
5. 张瑞玲;刘 红.双轴向列相液晶弹性系数的理论推导[J]. 液晶与显示, 2009,24(1): 1-8