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弹性键相连的双矩形板液晶分子系统的相变

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摘要： 根据分子间简单相互作用能,利用平均场理论,得到双矩形板液晶分子系统在温度和分子结构参数平面内随着弹性键强度的增加出现的4类相图:第一类相图(弹性键强度最小)中只有一个直接由各向同性相进入双轴向列相的Landau点,从单轴相到双轴向列相的相变为二级相变;第二类相图中Landau点扩展为Landau曲线,正的单轴相范围增加,负的单轴相范围缩小,出现了从单轴相到双轴相的一级相变;第三类相图中,Landau点同样扩展为Landau曲线,但负单轴相区域消失;第四类相图中(弹性键强度最大),Landau曲线范围反而缩小。

关键词： 双轴向列相液晶 相变 四足形分子

Phase Transitions of Molecular System Consisted by Double Rectangular Plates Connected by Flexible Chain

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Abstract: The phase transitions of molecular system consisted by double rectangular plates connected by flexible chain are studied in this paper. Based on a simple interaction energy between molecules and the approximation of mean-field theory, as the interaction strength of flexible chain increases, four kinds of phase diagrams in the plane of molecular structure and temperature are obtained. In the first kind (where the interaction strength is the smallest) there is only one Landau point that allows system directly transit from isotropic phase to biaxial phase. In the second kind, Landau point spreads to a Landau curve. The region of positive uniaxial phase increases and that of negative uniaxial phase decreases. In the phase diagram, a first order transition from uniaxial phase to biaxial phase appears. In the third kind Landau point also spreads to a Landau curve, but the region of negative uniaxial phase disappears. In the fourth kind(the interaction strength of flexible chain is the largest), the range of Landau curve becomes narrower.

Keywords: biaxial nematics phase transition tetrapodes

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参考文献：

[1] Freiser M J. Ordered states of a nematic liquid [J]. *Phys. Rev. Lett.,* 1970, 24(19):1041-1043. [2] Yu L J, Saupe A. Observation of a biaxial nematic phase in potassium laurate-1-decanol-water mixtures [J]. *Phys. Rev. Lett.,* 1980, 45 (12):1000-1003. [3] 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). [4] Neupane K, Kang S W, Sharma S, *et al.*Dynamic light scattering study of biaxial ordering in a thermotropic liquid crystal [J]. *Phys. Rev. Lett.,*2006, 97(20):207802(1-4). [5] Bates M A, Luckhurst G R. Biaxial nematic phases and V-shaped molecules: A Monte Carlo simulation study [J]. *Phys. Rev. E.*, 2005,72(5): 051702 (1-15). [6] 李策,郑桂丽,张志东. 双轴向列相液晶中Landau点的确定[J]. 液晶与显示, 2009,24(3):333-339. [7] 王焕景,刘红. 十字形液晶分子系统各向同性相至双轴向列相的相变[J]. 南京师范大学学报, 2011,34(2):39-44.

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