

物理

在一种新的聚合物网络液晶材料上刻写相光栅及其特性

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摘要:

研究在负性液晶N\|(4\|甲氧基亚苄基)对丁基苯胺(MBBA)中溶解聚合物形成一种新型聚合物的网络液晶(PNLC)体系. 该体系中溶解的聚合物不需光辐照即可自发形成聚合物网络结构, 利用双光束干涉法在该网络上刻写相光栅. 比较MBBA液晶掺杂聚合物前后所形成Williams畴的条件和形貌差异, 聚合物网络结构使得MBBA液晶形成Williams畴的信号频率由50.3 Hz提高到622 Hz. 在未掺杂聚合物的情况下, MBBA液晶的Williams畴在信号频率为65.9 Hz时即开始逐渐消退, 但具有网络结构后, MBBA液晶的Williams畴并未消退, 从而提高了液晶取向的稳定性. 而且聚合物网络所记录的相光栅与在电场作用下液晶形成的相光栅互不干扰.

关键词: 聚合物网络液晶 相分离 Williams畴 相光栅

Characteristics of a New |Polymer Network Liquid Crystal Material with Phase Grating

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Abstract:

The authors studied a new polymer network liquid crystal (PNLC) system of the polymer dissolved in N\|(4\|methoxybenzal)-p-butylaniline (MBBA) liquid crystal. The dissolved polymer which did not require light radiation, formed spontaneously a polymer network structure in the system. Phase grating was engraved on the polymer network via double\|beams interference method. The differences of the conditions and morphologies of the Williams domains in the MBBA liquid crystal before and after doping the polymer were compared. Polymer network structure made the signal frequency of the formation of Williams domains in the MBBA liquid crystal raise from 50.3 Hz to 622 Hz. In the case of without doping the polymer, Williams domains in the MBBA liquid crystal begin to disappear when the signal frequency is 65.9 Hz, but Williams domains in the MBBA liquid crystal don't disappear when the polymer network structure exists, hence improving the stability of liquid crystal orientation. Moreover, the phase grating engraved on the polymer network and the phase grating formed in the MBBA liquid crystal under the influence of an electric field don't interfere with each other.

Keywords: polymer network liquid crystal phase separation Williams domain phase grating

收稿日期 2010-10-08 修回日期 网络版发布日期

DOI:

基金项目:

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