



Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/gmcl16>

Periodic Director Patterns in Twist and Splay Frederiks Transitions in Tobacco Mosaic Virus Liquid Crystals

Franklin Lonberg^a, Seth Fraden^a, Alan J. Hurd^a & Robert B. Meyer^a

^a Department of Physics, Brandeis University Waltham, MA, 02254

Version of record first published: 20 Apr 2011.

To cite this article: Franklin Lonberg, Seth Fraden, Alan J. Hurd & Robert B. Meyer (1984): Periodic Director Patterns in Twist and Splay Frederiks Transitions in Tobacco Mosaic Virus Liquid Crystals, *Molecular Crystals and Liquid Crystals*, 106:3-4, 419-419

To link to this article: <http://dx.doi.org/10.1080/00268948408071472>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

PERIODIC DIRECTOR PATTERNS IN TWIST AND SPLAY
FREDERIKS TRANSITIONS IN TOBACCO MOSAIC VIRUS
LIQUID CRYSTALS

FRANKLIN LONBERG, SETH FRADEN, ALAN J. HURD and
ROBERT B. MEYER
Department of Physics
Brandeis University
Waltham, MA 02254

Abstract. When a magnetic field is applied in the plane and perpendicular to the unperturbed director of a uniform planar-aligned liquid crystal, a twist Frederiks transition occurs. For fields greater than a critical value, periodic bend-modulated twist distortions are dynamically favored over the uniform twist distortion. This is because the periodic flow pattern associated with the bend twist distortion lowers the effective viscosity more than it raises the elastic restoring torque. Under crossed polarizers the sample has a striped texture with the stripes perpendicular to the initial director. The wavelength of the stripe texture is field dependent.

When the magnetic field is applied perpendicular to the uniform planar sample, a similar striped distortion occurs above a critical field value, dominated by splay rather than twist. The most striking difference from the twist transition is that there is a thickness-dependent angle between the stripes and the original director whereas in thinner samples, the stripes tend to be more parallel to the original director. The initial development of the structure appears as a lattice of diffuse spots on a diamond-shaped grid, a precursor that is not seen in the twist instability, which nucleates as stripes at the boundaries of the cell. The splay Frederiks transition also exhibits a field-dependent wavelength distortion.