

Title: Filling and wetting transitions of nematic liquid crystals on sinusoidal substrates

Author(s): Patrício, P.^{1,2}; Silvestre, N. M.²; Pham, C. -T.³; Romero-Enrique, J. M.⁴

Source: Physical Review E

Volume: 84 **Issue:** 2 **Article Number:** 021701 **DOI:** 10.1103/PhysRevE.84.021701 **Published:** Aug 1 2011

Document Type: Article

Language: English

Abstract: Close to sinusoidal substrates, simple fluids may undergo a filling transition, in which the fluid passes from a dry to a filled state, where the interface remains unbent but bound to the substrate. Increasing the surface field, the interface unbinds and a wetting transition occurs. We show that this double-transition sequence may be strongly modified in the case of ordered fluids, such as nematic liquid crystals. Depending on the preferred orientation of the nematic molecules at the structured substrate and at the isotropic-nematic interface, the filling transition may not exist, and the fluid passes directly from a dry to a complete-wet state, with the interface far from the substrate. More interestingly, in other situations, the complete wetting transition may be prevented, and the fluid passes from a dry to a filled state, and remains in this configuration, with the interface always attached to the substrate, even for very large surface fields. Both transitions are observed only for a same substrate in a narrow range of amplitudes.

KeyWords Plus: Phase-Transition; Surfaces; Adsorption; Films; Water; Layer

Reprint Address: Patrício, P (reprint author), Inst Super Engrn Lisboa, Rua Conselheiro Emídio Navarro 1, P-1959007 Lisbon, Portugal.

Addresses:

1. Inst Super Engrn Lisboa, P-1959007 Lisbon, Portugal
2. Univ Lisbon, Ctr Fis Teor & Computac, P-1649003 Lisbon, Portugal
3. Univ Paris 11, Lab Informat Mecan & Sci Ingenieur, CNRS UPR 3251, F-91403 Orsay, France
4. Univ Seville, Dept Fis Atom Mol & Nucl, Area Fis Teor, ES-41080 Seville, Spain

E-mail Address: patricio@cii.fc.ul.pt

Funding:

Funding Agency	Grant Number
FCT (Portugal)	PEst-OE/FIS/UI0618/2011 PTDC/FIS/098254/2008 SFRH/BPD/40327/2007
Acção Integrada Luso-Espanhola	E 17/09
Spanish Ministerio de Ciencia e Innovacion	FIS2009-09326 HP2008-0028
Junta de Andalucia	P09-FQM-4938

Publisher: Amer Physical Soc

Publisher Address: One Physics Ellipse, College PK, MD 20740-3844 USA

ISSN: 1539-3755

Citation: PATRÍCIO, P.; SILVESTRE, N. M.; PHAM, C. -T.; ROMERO-ENRIQUE, J. M. - Filling and wetting transitions of nematic liquid crystals on sinusoidal substrates. Physical Review E. ISSN 1539-3755. Vol. 84, n.º 2 (2011).