Title: Electro-rheology study of a series of liquid crystal cyanobiphenyls: experimental and theoretical treatment

Author(s): **Patrício, P.**[1,2]; **Leal, C. R.** [1,3]; Pinto, L. F. V.[3]; Boto, A.[3]; Cidade, M. T.[3]

Source: Liquid Crystals
Volume: 39 **Issue:** 1
Pages: 25-37 **DOI:** 10.1080/02678292.2011.610471 **Published:** 2012

Abstract: In this work we study the electro-rheological behaviour of a series of four liquid crystal (LC) cyanobiphenyls with a number of carbon atoms in the alkyl group, ranging from five to eight (5CB-8CB). We present the flow curves for different temperatures and under the influence of an external electric field, ranging from 0 to 3 kV mm(-1), and the viscosity as a function of the temperature, for the same values of electric field, obtained for different shear rates. Theoretical interpretation of the observed behaviours is proposed in the framework of the continuum theory of Leslie-Ericksen for low molecular weight nematic LCs. In our analysis, the director alignment angle is only a function of the ratio between the shear rate and the square of the electric field - boundary conditions are neglected. By fitting the theoretical model to the experimental data, we are able to determine some viscosity coefficients and the dielectric anisotropy as a function of temperature. To interpret the behaviour of the flow curves near the nematic-isotropic transitions, we apply the continuum theory of Olmsted-Goldbart, which extends the theory of Leslie-Ericksen to the case where the degree of alignment of the LC molecules can also vary.

Document Type: Article

Language: English

Author Keywords: Liquid Crystals; Electro-Rheology; Leslie-Ericksen Theory; Cyanobiphenyls

KeyWords Plus: Nematic Phase; Dielectric-Properties; Electric-Field; Shear-Flow; Transitions; Viscosity; Constants

Reprint Address: Patrício, P (reprint author), Inst Super Engn Lisboa, Lisbon, Portugal.

Addresses:
1. Inst Super Engn Lisboa, Lisbon, Portugal
2. Univ Lisbon, Ctr Fis Teor & Computac, P-1699 Lisbon, Portugal
3. Univ Nova Lisboa, Dept Ciencia Mat, Fac Ciencias & Tecnol, CENIMAT I3N, Caparica, Portugal

E-mail Address: pedro.patricio@dem.isel.ipl.pt

Publisher: Taylor & Francis LTD
Address Publisher: 4 Park Square, Milton Park, Abingdon Ox14 4RN, Oxon, Enbgland

IDS Number: 876VZ

ISSN: 0267-8292