Author(s): Cidade, MT (Cidade, M. T.); Leal, CR (Leal, C. R.); Patricio, P (Patricio, P.)

Title: An electro-rheological study of the nematic liquid crystal 4-n-heptyl-4'-cyanobiphenyl

Source: LIQUID CRYSTALS, 37 (10): 1305-1311 2010

Language: English

Document Type: Article

Author Keywords: electrorheology; liquid crystals; 7CB; continuum theory

KeyWords Plus: DIELECTRIC-PROPERTIES; ANISOTROPIC FLUIDS; POLYMERS; PHASE

Abstract: An experimental and theoretical study of the electro-rheological effects observed in the nematic phase of 4-n-heptyl-4'-cyanobiphenyl has been conducted. This liquid crystal appears to be a model system, in which the observed rheological behaviour can be interpreted by the Leslie-Ericksen continuum theory for low molecular weight liquid crystals. Flow curves are illustrated at different temperatures and under the influence of an external electric field ranging from 0 to 3 kV mm-1, applied perpendicular to the direction of flow. Also presented is the apparent viscosity as a function of temperature, over similar values of electric field, obtained at different shear rates. A master flow curve has been constructed for each temperature by dividing the shear rate by the square of the electric field and multiplying by the square of a reference value of electric field. In a log-log plot, two Newtonian plateaux are found to appear at low and high shear rates, connected by a shear-thinning region. We have applied the Leslie-Ericksen continuum theory, in which the director alignment angle is a function of the electric field and the flow field boundary conditions are neglected, to determine viscoelastic parameters and the dielectric anisotropy.

Addresses: [Cidade, M. T.] Univ Nova Lisboa, Dept Mat Sci, Caparica, Portugal; [Cidade, M. T.; Leal, C. R.] Univ Nova Lisboa, CENIMAT I3N, Caparica, Portugal; [Leal, C. R.; Patricio, P.] Polytech Inst Lisbon, Sci Area Phys, ISEL, Lisbon, Portugal; [Patricio, P.] CFTC Univ Lisbon, Lisbon, Portugal

Reprint Address: Cidade, MT, Univ Nova Lisboa, Dept Mat Sci, Caparica, Portugal.

E-mail Address: mtc@fct.unl.pt

Publisher: TAYLOR & FRANCIS LTD

Publisher Address: 4 PARK SQUARE, MILTON PARK, ABINGDON OX14 4RN, OXON, ENGLAND

ISSN: 0267-8292

DOI: 10.1080/02678292.2010.504863

29-char Source Abbrev.: LIQ CRYST

ISI Document Delivery No.: 668ZO