Shear-induced lamellar ionic liquid crystal foam

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In a recent paper we reported an experimental study of two *N*-alkylimidazolium salts. These ionic compounds exhibit liquid crystalline behaviour with melting points above 50ºC in bulk. However, if they are sheared a (non-equilibrium?) lamellar phase forms at room temperature[1]. Upon shearing a thin film of the material between microscope slides, textures were observed that are strikingly similar to liquid (wet) foams. In a first approach, the images obtained from polarizing optical microscopy (POM) were found to share many of the known quantitative properties of a two-dimensional foam coarsening process[2,3]. This introduces new interesting problems relating to the structural aspects and physical behaviour of this system. These questions concern the molecular organization within the cell walls and *Plateau borders* of the foam and also the forces that determine the observed foam-like behaviour. Here we report an experimental study of this foam using a shearing system coupled to POM. The structure and evolution of the foam are investigated through the image analysis of time sequences of micrographs obtained for well controlled sets of physical parameters (sample thickness, shear rate and temperature).

(1) M. H. Godinho, C. Cruz, P. I. C. Teixeira, A. J. Ferreira, C. Costa, P. S. Kulkarni. and C. A. M. Afonso, *Liq. Cryst.* **2008**, *35*, 103

(2) C. Cruz, M.H. Godinho, A.J. Ferreira, P.S. Kulkarni, C.A.M. Afonso, and P.I.C. Teixeira, *Phil. Mag. Lett.* **2008**, *88*, 741

(3) See, e.g., D. Weaire and S. Hutzler, *The Physics of Foams* (Oxford University Press, Oxford, 1999).