

# TRANSLATIONAL SELF DIFFUSION IN SMECTIC PHASES OF CALAMITIC LIQUID CRYSTALS

Mario Cifelli

Dipartimento di Chimica e Chimica Industriale, Università di Pisa, Via Risorgimento 35, 56126  
Pisa, ITALY

Molecular self-diffusion in thermotropic liquid crystals can provide insight into the anisotropic interactions that underlie mesophasic assemblage and molecular order [1-4]. Various experimental techniques have been exploited to measure self-diffusion, such as quasi elastic neutron scattering (QENS) [5], tracer diffusion [6], electron spin resonance imaging [7] and pulsed-field-gradient (PFG) nuclear magnetic resonance (NMR) [8]. Amongst these, PFG NMR is particularly valuable as it allows direct determination of self-diffusion coefficients without the necessity of specific probes and tracers or isotopic labelling [8-10].

In this communication a brief overview of NMR experiments suitably tailored to measure self-diffusion in fast relaxing systems will be followed by the presentation of recent results obtained applying these techniques to smectic phases, with particular attention to the chiral variances of the tilted smectic C phase. The translational self-diffusion coefficients measured *via* NMR will be discussed and compared with the ones determined by means of other techniques.

## References

- [1] G.J. Krüger, *Phys. Rep.*, 1982, **82**, 229
- [2] F. Noack, St. Becker and J. Struppe, *Annu. Rep. NMR Spectrosc.*, 1997, **33**, 1
- [3] I. Furó. and S.V. Dvinskikh, *Magn. Reson. Chem.*, 2002, **40**, S3
- [4] M. Cifelli, G. Cinacchi and L. De Gaetani, *J. Chem. Phys.*, 2006, **125**, 164912
- [5] R.M. Richardson, A.J. Leadbetter, D.H. Bonsor and G.J. Krüger, *Mol. Phys.*, 1980, **40**(3), 741
- [6] T. Moriyama, Y. Takanishi, K. Ishikawa, H. Takezoe and A. Fukuda, *Liq. Cryst.*, 1995, **18**(4), 639
- [7] J.K. Moscicki, Y.K. Shin and J.H. Freed, *J. Chem. Phys.*, 1993, **99**(1), 634
- [8] R. Blinc, J. Pirš and I Zupančič, *Phys. Rev. Lett.*, 1973, **30**, 546
- [9] R. Blinc, M. Burgar, M.Luzar, J. Pirš, I Zupančič and S. Žumer, *Phys Rev. Lett.*, 1974, **33**, 1192
- [10] S.V. Dvinskikh and I. Furó, *J. Magn. Reson.*, 2000, **146**, 283