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## The Dynamic Properties of 5Cb Filled with Aerosil Particles Investigated by Pcs

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### Abstract

Nematic liquid crystal filled with Aerosil particles, a prospective composite material for optoelectronic application, has been investigated by static light scattering and Photon Correlation Spectroscopy (PCS). The Aerosil particles in filled nematic liquid crystals (FN) form a network structure with LC domains about 2500 Å in size with a random distribution of the director orientation of each domain.

We found that the properties of 5CB are considerably affected by the network. The N-I phase transition in filled 5CB was found to be smeared out and depressed. PCS experiments show that two new relaxation processes appear in filled 5CB in addition to the director fluctuation process in bulk. The slow relaxation process, with a broad spectrum of relaxation times, is somewhat similar to the slow decay, which is observed in confined nematic liquid crystal.

The middle frequency process was assigned to the director fluctuations in the surface layer formed at the particle-LC interface. The decay function describing this relaxation process is a stretched exponential ( $\beta \approx 0.7$ ). The temperature dependence of the relaxation times of the middle frequency obeys the Vogel-Rilcher law. Such a temperature dependence, accompanied by a broad spectrum of relaxation times suggests that the dynamics of the director fluctuations near the Aerosil particle-LC interface is glass-like.

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### Linked references

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1 P.S. Drzaic , *Liquid Crystal Dispersions*, (World Scientific, Singapore, 1995).

- [CrossRef](#) [Google Scholar](#)

3 D. Finotello and J. Iannacchione , *Int. Journ. Mod. Phys. B* 9, 109 (1995).

- [CrossRef](#)
- [Google Scholar](#)

4 G.P. Crawford and S. Zumer , *Int. Journ. Mod. Phys. B* 9, 331 (1995).

- [CrossRef](#) [Google Scholar](#)

6 X-l. Wu , W.I. Goldberg , M.X. Liu , and J.Z. Xue , *Phys. Rev. Lett.* 69, 470 (1992).

- [CrossRef](#)

7 T. Bellini , N.A. Clark , D.W. Schaefer , *Phys. Rev. Lett.* 74, 2740 (1995).

- [CrossRef Google Scholar](#)
  
- 8 A. Mertelj , L. Spindler , and M. Copic , *Phys. Rev. E* 56, 549 (1997).
- [CrossRef Google Scholar](#)
  
- 9 A. Mertelj and M. Copic , *Phys. Rev. E* 55, 504 (1997).
- [CrossRef Google Scholar](#)
  
- 10 F.M. Aliev and G.P. Sinha , *Mol. Cryst. Liq. Cryst.* 303, 325 (1997).
- [CrossRef Google Scholar](#)
  
- 11 M. Copic and A. Mertelj , *Phys. Rev. Lett.* 80, 1449 (1998).
- [CrossRef Google Scholar](#)
  
- 12 M. Kreuzer , T. Tschudi , W.H. de Jeu , and R. Eidenschink , *Appl. Phys. Lett.* 62, 1712 (1993).
- [CrossRef Google Scholar](#)
  
- 14 B. Zhou , G.S. Iannacchione , C.W. Garland , and T. Bellini , *Phys. Rev. E* 55, 2962 (1997).
- [CrossRef](#)
  
- 15 T. Bellini , N.A. Clark , V. Degiorgio , F. Mantegazza , and G. Natale , *Phys. Rev. E* 57, 2996 (1998).
- [CrossRef Google Scholar](#)
  
- 16 G.S. Iannacchione , C.W. Garland , J.T. Mang , and T.P. Rieker , *Phys. Rev. E* 58, 5966 (1998).
- [CrossRef](#)
  
- 17 F. Aliev , M. Kreuzer , N. Tabiryan , and B. Zel'dovich , *Mol. Cryst. Liq. Cryst.* 320, 173 (1998).
- [CrossRef Google Scholar](#)
  
- 19 *Disorder Effects on Relaxational Processes*, edited by R. Richert and A. Blumen (Springier Verlag, Berlin 1994).
- [CrossRef Google Scholar](#)
  
- 20 A.L. Demirel and S. Granik , *Phys. Rev. Lett.* 77, 2261 (1996).
- [CrossRef Google Scholar](#)