52. Däitsch Konferenz iwwer Flëssegkristallen
52. Deutsche Arbeitstagung Flüssigkristalle
52nd German Liquid Crystal Conference
GLCC2026
University of Luxembourg, Belval Campus
Esch-Uelzecht (LU), 08–10 April 2026

Non-volatile memory devices based on nematic liquid crystal doped with aerosil nanoparticles

Natália Tomašovičová[1,*], Katarína Konyová[1], Dmytro Miakota[1], Veronika Lacková[1], and Shie-Chang Jeng[2]

[1] *Institute of Experimental Physics, Slovak Academy of Sciences, Košice, Slovakia*
[2] *Institute of Imaging and Biomedical Photonics, National Yang Ming Chiao Tung University, Tainan, Taiwan*
**Corresponding author e-mail: nhudak@saske.sk*

Within several decades, the physics of soft matter has become an expanding branch of science, including materials as liquid crystals (LCs). During the past few decades, significant efforts have been made to improve their already outstanding properties by doping them with various nanoparticles as they have the potential to modify the basic properties of liquid carriers. One of such example of soft matter are liquid crystals doped with silica nanoparticles which have also great potential to serve as non-volatile memory devices, which can be used for information storage as the information is retained even after removing the power. Memory effect was observed mostly in smectic phase of ferroelectric liquid crystals [1-3]. Nematic liquid crystals doped with aerosil nanoparticles (NPs) exhibit a notable electromechanical [4] and magnetomechanical memory effect [5], where the state induced by electric or magnetic fields remains stable even after the fields are removed. In this study the impact of electric and magnetic fields on the memory behavior of the nematic LC 4-cyano-4′-pentylbiphenyl (5CB) doped with non-magnetic aerosil NPs of different size and surface treatment was investigated (see Figure 1).

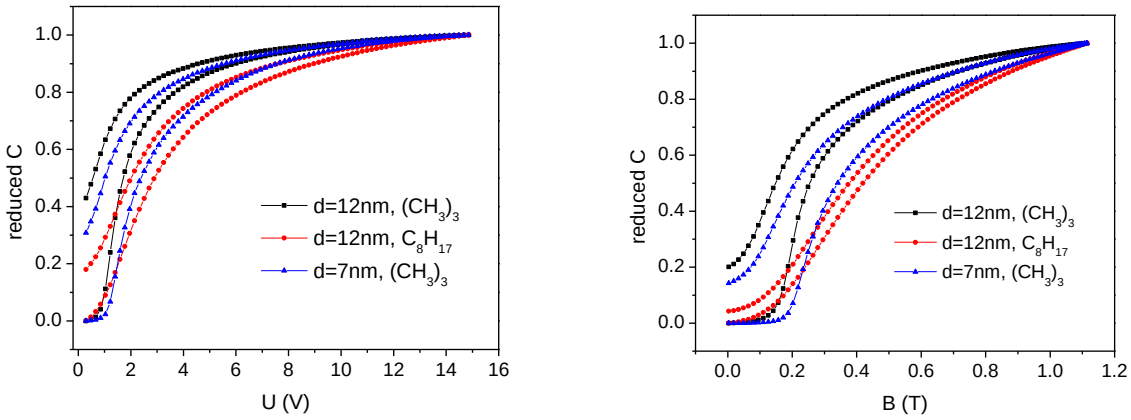

Figure 1. *The electromechanical, and magnetomechanical memory effect in the composite of 5CB liquid crystal and aerosil nanoparticles.*

References

[1] A. Choudhary, S. Kaur, G. Singh *et al*, *J Appl Phys* **101**, 074112 (2007)
[2] S. Kaur, A.K. Thakur, S.S. Bawa, A.M. Biradar, *Appl Phys Lett* **88**, 122905 (2006)
[3] A.K. Thakur, S.S. Bawa, A.M. Biradar *et al*, *J Appl Phys* **97**, 084106 (2005)
[4] V. Gdovinová, N. Tomašovičová, Shie-Chang Jeng *et al*, *J Mol Liq* **282**, 286-291 (2019)
[5] K. Kónyová, D. Miakota, V. Lacková, *et al*, *J Mol Liq* **400**, 124511 (2024)

Acknowledgments

Funding was provided by the Slovak Research and Development Agency project APVV SK-TW-RD-24-0007, and National Science and Technology Council of Taiwan, 114-2923-M-A49-006-MY3.