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Non-volatile memory effect in liquid crystals doped with aerosil and magnetic nanoparticles

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Liquid crystals (LCs) doped with aerosil nanoparticles (NPs) exhibit a notable electromechanical and magnetomechanical memory effect, where the state induced by electric or magnetic fields remains stable even after the fields are removed, a phenomenon known as the non-volatile memory effect. This study investigates 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 and a combination of aerosil and magnetic nanoparticles. Capacitance-voltage and capacitance-magnetic field dependencies demonstrated hysteresis with the memory effect significantly influenced by field magnitude [1], temperature, and heating/cooling rates [2]. Notably, the system allows for multilevel memory storage, driven by varying field strengths, and the memory states can be reset by thermal treatment to restore the initial configuration. These findings highlight the potential of such composites for the development of voltage-driven or magnetic field-driven non-volatile memory devices.

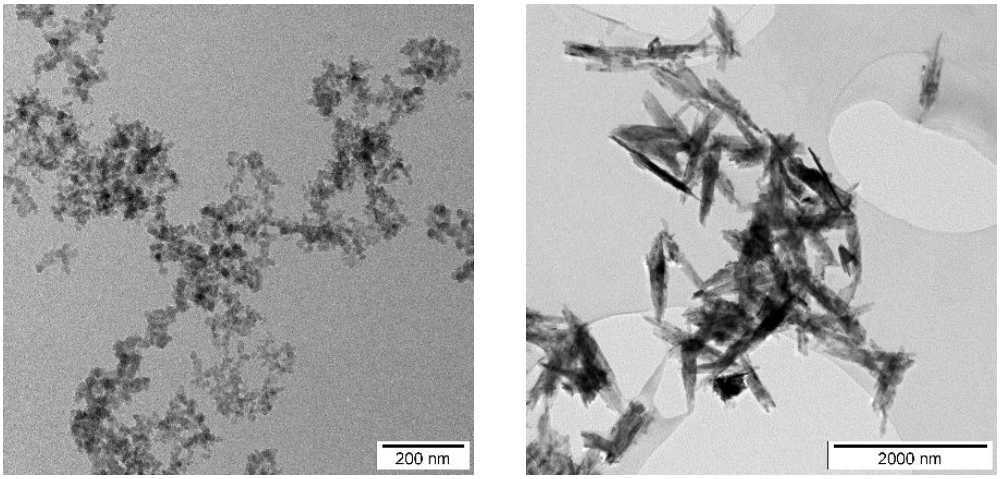

Figure 1: TEM images of the aerosil nanoparticles (left) and goethite nanoparticles (right).

[1] K. Kónyová, D. Miakota, V. Lacková, S.-C. Jeng, D. Węgłowska, F. Agresti, P. Kopčanský, N. Tomašovičová, *Journal of Molecular Liquids*, 400, 124511 (2024).
[2] K. Kónyová, D. Miakota, V. Lacková, S.-C. Jeng, D. Węgłowska, F. Agresti, M. Jarošová, P. Kopčanský, N. Tomašovičová, *Journal of Molecular Liquids*, 391, 123357 (2023).

Acknowledgments

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