Aggregation induced emission versus aggregation caused quenching: tuning the emission behaviour of liquid crystalline materials

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Luminescent liquid crystals represent a combination of an emissive material which exhibits responsive mesomorphic structures. Therefore, these systems are promising for the development of sensor, data storage and optoelectronic materials. A typical challenge for this class of materials is the phenomenon of aggregation caused quenching (ACQ). This effect is observed in ordered phases like the mesophase or the crystalline state and interferes with radiative relaxation. Luminophores showing aggregation induced emission (AIE) benefit from the higher order and nonradiative relaxation mechanisms are prevent. Therefore, LC-Materials which show properties of fluids and ordered phases can support radiative and nonradiative relaxation of ACQ and AIE luminophores respectively.[1]

In this project we introduce a new concept for thermo-responsive luminescent liquid crystals. The unique combination of two groups of luminophores, exhibiting either AIE or ACQ within a liquid crystalline matrix, yielded an emission shift from green (534 nm) to red (619 nm). Thereby, the emission wavelength is controlled by the aggregation state within the liquid crystalline material, which can be controlled by temperature. This temperature-controlled material mimics an luminescent traffic light and is suitable as a thermo sensor warning of heat.[1]

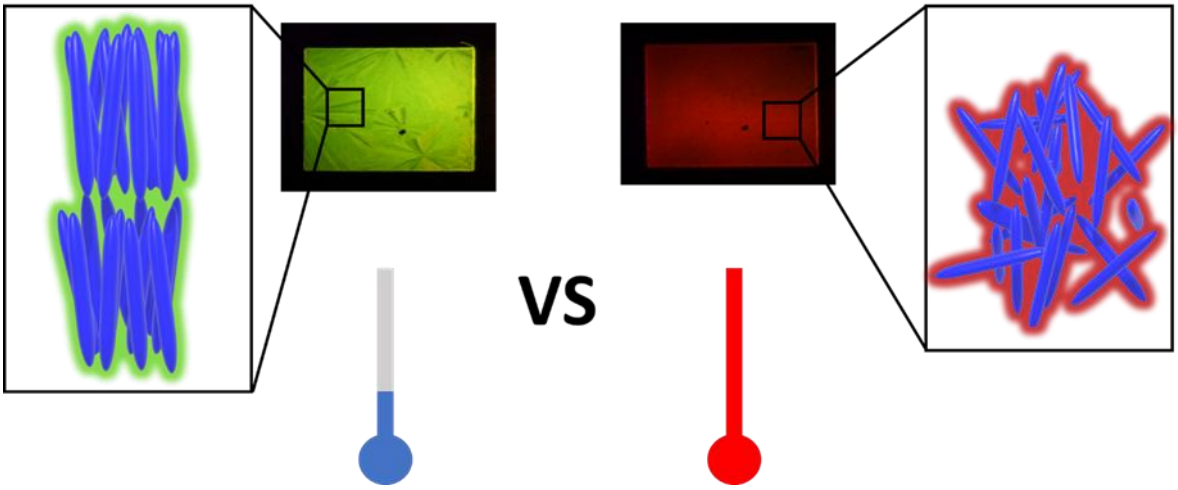

Figure 1: Schematic representation of the thermo sensor based on a luminescent liquid crystalline material. (reproduced with permission of the royal society of chemistry[1])

References:

[1] T. Neumann, S. T. N. Sailaja, J. Voskuhl, M. Giese*, *J. Mater. Chem. C*, **2025**,*13*, 18305-18311