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Rigid-body Rotation of Cholesteric Droplets Driven by Heat Flux

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When a cholesteric droplet dispersed in a liquid is subjected to a temperature gradient, it exhibits unidirectional steady textural rotation under a polarizing microscope. The thermomechanical coupling in chiral LCs, called the Lehmann effect, has been recently refocused and investigated by several groups. While significant progresses have been achieved in the last decade, the experimental results as well as their interpretation sometimes conflicted with one another. By microscopy, we do not know what the textural rotation of the droplets exactly means. Cholesteric droplets possess two independent rotational degrees of freedom, i.e., director rotation and rigid-body rotation, which cannot be distinguished by microscopy observation. To give a clear answer to the question, using Particle-tracking-method, we revealed that the droplets rotated as a rigid-body under a heat flux and confirmed that the rigid rotation agreed with the prediction based on the surface anchoring and the orientational elasticity. The result will help the better understanding of the Lehmann effect and its future application to a microdevice.

[1] K. Nishiyama, S. Bono, and Y. Tabe, Soft Matter **17** (2021) 10818.