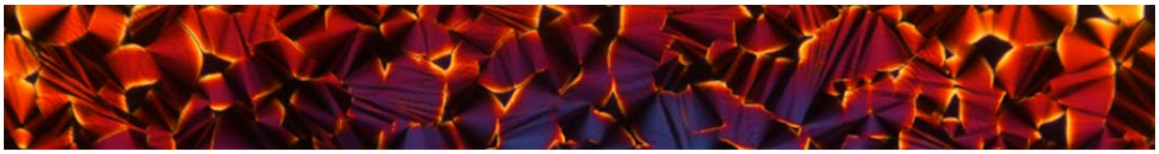

Soft Materials Research Center

Special Seminar Series

Squirming motion of baby Skyrmions in chiral nematic liquid crystals

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Recent developments in the emergent field of skyrmionics promise racetrack memories that could revolutionize modern data storage devices [1]. Such applications are enabled by the topology-protected nature of spin textures of the two-dimensional magnetic skyrmions (often called “baby skyrmions”), which are characterized by the elements of the second homotopy group $\pi_2(S^2)=\mathbb{Z}$. Trains of individual skyrmions with dimensions ~50 nm at room temperature can be driven by electrical current pulses, drawing considerable interest to electrically controlled non-equilibrium behavior of the $\pi_2(S^2)=\mathbb{Z}$ solitons [1]. Using a combination of numerical modeling and experimentation [2,3], we demonstrate and characterize both self-assembly and squirming motion of baby Skyrmions in chiral nematic liquid crystals. Using video microscopy and nonlinear optical imaging, as well as capitalizing on the liquid crystalline nature of the host medium, we reveal intricate details of non-equilibrium topology-preserving textural changes associated with this behavior. We show that the motion direction is well defined and can be reversed by changing the frequency of the applied field and we fully reproduce experimental observations through numerical modeling [3].

1. S. Krause & R. Wiesendanger. Nature Mater. **15**, 493 (2016).
2. P. J. Ackerman, J. van de Lagemaat & I. I. Smalyukh. Nature Comm. **6**, 6012 (2015).
3. P. J. Ackerman, T. Boyle & I. I. Smalyukh. (2016).

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