Floquet topological crystalline colloidal transport

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Topological protection allows robust transport of localized phenomena such as quantum information, solitons and dislocations. The transport can be either dissipative or non-dissipative. Here, we experimentally demonstrate and theoretically explain the topologically protected dissipative motion of colloidal particles above periodic magnetic patterns. By driving the system with periodic modulation loops of an external and spatially homogeneous magnetic field, we achieve total control over the motion of diamagnetic and paramagnetic colloids. We can transport simultaneously and independently each type of colloid along any of the crystallographic directions of the pattern via adiabatic or deterministic ratchet motion. Both types of topological motion are protected by the lattice symmetry of the pattern. As an application, we implement an automatic topologically protected quality control of a chemical reaction between functionalized colloids. The similarities and the differences in the lattice symmetry protected transport of classical over-damped colloidal particles versus the topologically protected transport in quantum mechanical systems are emphasized.

References:

[1] J. Loehr, M. Loenne, A. Ernst, D. de las Heras, and Th. M. Fischer; Topological protection of multiparticle dissipative transport *Nat. Comm.* **7**, 11745 (2016).

[2] D. de las Heras and J. Loehr and M. Loenne and Th. M. Fischer; Topologically protected colloidal transport above a square magnetic lattice, *New J. Phys.* **18**, 105009 (2016).