Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Seminar

Odd viscosity in chiral active fluids

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Chiral active fluids are materials composed of self-spinning rotors that continuously inject energy and angular momentum at the microscale. Out-of-equilibrium fluids with active-rotor constituents have been experimentally realized using nanoscale biomolecular motors, microscale active colloids, or macroscale driven chiral grains. Here, we show how such chiral active fluids break both parity and time-reversal symmetries in their steady states, giving rise to a dissipationless linear-response coefficient called odd viscosity in their constitutive relations. Odd viscosity couples pressure and vorticity leading, for example, to density modulations within a vortex profile. Moreover, chiral active fluids flow in the direction transverse to applied compression as in shock propagation experiments. We envision that this collective transverse response may be exploited to design self-assembled hydraulic cranks that convert between linear and rotational motion in microscopic machines powered by active-rotors fluids.

Wednesday, Oct 11th 2017

04:00 PM (Tea/Coffee at 03:45 PM)

Auditorium, TIFR-H (FReT-B)