

**[Research breakthrough] Congratulations to Asst Prof Ni Ran: Hydrodynamics of random-organizing hyperuniform fluids**

Our warmest congratulations to Asst Prof Ni Ran and his research team, who have formulated the first hydrodynamic theory for non-equilibrium hyperuniform fluids with potential applications in designing flowing functional hyperuniform materials.

Disordered hyperuniform structures are locally random while uniform like crystals at large length scales. Recently, an exotic hyperuniform fluid state was found in a number of non-equilibrium systems, which shows the promise for fabrication of novel lifelike functional materials capable of self-healing and self-adapting. However, the general mechanism of fluidic hyperuniformity and its fundamental difference from equilibrium fluids remain unclear, which severely hinders the rational design of non-equilibrium hyperuniform fluids. In this work, research fellow Dr. Qun-Li Lei and Prof. Ran Ni propose a non-equilibrium hard-sphere model of hyperuniform fluids and formulate a full hydrodynamic description based on the generalized Navier-Stokes equations. The theory reveals the mechanism of fluidic hyperuniformity in a simple and intuitive way, which is confirmed by numerical simulations of a realistic active spinner system.

The research was published in Proceedings of National Academy of Sciences (USA) on 30 October 2019:

For more information, you may refer to:

<https://www.pnas.org/content/early/2019/10/29/1911596116>