北京大学力学与工程科学学院

Programmable Active Matter by Liquid Crystals

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内容简介：

Active matter is the marvel of nature. The challenge lies in commanding its chaotic behavior. By dispersing swimming bacteria in a liquid crystalline (LC) environment with spatially varying orientation defined by the liquid crystalline polymer networks, we demonstrate control over the distribution of bacterial concentration, as well as the geometry and polarity of their trajectories. Bacteria recognize subtle differences in the topological structures in the LC, engaging in bipolar swimming in regions of pure splay and bend but switching to unipolar swimming in mixed splay-bend regions. Next, I will talk about how to use the morphology changes of the light-driven disclination networks to transport the colloids. The colloidal assemblies can be collectively transported and assembled in a programmable fashion. Besides, after the colloids are combined with the disclination lines, the lines can be extended around the colloids to form topological entanglement structures with different chirality. The response of nematic colloidal entanglement in the non-equilibrium morphology changes of disclination lines is a nontrivial fundamental question. Besides, during the morphology changes of disclination networks with changing geometrical profiles, the colloidal entanglement can assemble, split, rotate and form double helix structures. Our programmable active matter will open opportunities in future developments of multi-functional devices for soft-robotics, flexible electronics, and biomedicine.

报告人简介:

彭晨晖，中国科学技术大学特任教授，博士生导师。2016年12月博士毕业于液晶显示发源地美国肯特州立大学液晶研究所（Liquid Crystal Institute at Kent State University）。2016年12月至2018年8月于美国麻省理工学院生物工程系从事博士后研究。2018年8月至2021年12月于美国孟菲斯大学物理系任助理教授，博士生导师。2021年入选国家创新人才引进计划青年项目，2022年加入中国科学技术大学物理学院，任特任教授。主要从事拓扑活性物质、软物质与生物物理、胶体自组装及仿生软体机器人等方面的研究，以第一作者或通讯作者在Science, PNAS, Science Advances, Nature Communications, Advanced Materials等期刊上发表论文。

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