

Description of Additional Supplementary Files for ‘Shaping active matter from crystalline solids to active turbulence’

Qianhong Yang ^{1,*} Maoqiang Jiang ^{2,1,*} Francesco Picano ³ and Lailai Zhu ^{1,†}

¹*Department of Mechanical Engineering, National University of Singapore, 117575, Singapore*

²*School of Naval Architecture, Ocean and Energy Power Engineering,
Wuhan University of Technology, Wuhan, Hubei, 430063, PR China*

³*Department of Industrial Engineering and CISAS “G. Colombo”, University of Padova, Padova, 35122, Italy*

SUPPLEMENTARY VIDEOS 1-11

- Filename: Supplementary Video 1
Description: Self-organization into a crystalline solid phase at a Péclet number $Pe = 2$ and area fraction $\phi = 0.12$.
- Filename: Supplementary Video 2
Description: Emergence of a gas-like phase with disks forming dynamic chains when $Pe = 3$ and $\phi = 0.12$.
- Filename: Supplementary Video 3
Description: Formation of a liquid phase when $Pe = 2.5$ and $\phi = 0.12$.
- Filename: Supplementary Video 4
Description: Disassociation of a bound dislocation pair into two free dislocations when a hexatic phase is identified at $Pe = 2.4$ and $\phi = 0.12$. A portion of the domain is shown here.
- Filename: Supplementary Video 5
Description: Certain dislocations unbind into isolated disclinations and they coexist in this liquid phase at $Pe = 2.5$ and $\phi = 0.12$. A portion of the domain is shown here.
- Filename: Supplementary Video 6
Description: An oscillatory instability occurs in the form of large-scale wave motion at $Pe = 5$, where $\phi = 0.5$ and the domain size $L = 200$.
- Filename: Supplementary Video 7
Description: A transitional scenario characterized by emerging disk clusters that breakdown the wave pattern. Here, $Pe = 10$, $\phi = 0.5$, and $L = 200$.
- Filename: Supplementary Video 8
Description: Active turbulence featuring both vortical structures and clusters formed by disks. Here, $Pe = 20$, $\phi = 0.5$, and $L = 200$.
- Filename: Supplementary Video 9
Description: Crossing and reflecting trajectories of two interacting phoretic disks of $Pe = 2.5$ as discussed in the Supplementary Information (SI).
- Filename: Supplementary Video 10
Description: Unlike Supplementary Video 9, two disks of $Pe = 2.5$ can also form a stable bound pair swimming in parallel as discussed in the SI.
- Filename: Supplementary Video 11
Description: A three-disk chain executes circular or straight trajectories intermittently as discussed in the SI, where $Pe = 20$.

* These two authors contributed equally

† lailai_zhu@nus.edu.sg