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Tuning Self Organization Of Confined Active Particles By Steepness Of The Trap : Supplementary Informations†

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1 Details of the video files :

(1) Movie1 : Spatial (hexagonal) as well as polar ordering of the self-propelling and self-aligning particles starting from random initial configuration within the circular trap with low steepness. Parameters (packing fraction, strength of rotational fluctuation, strength of trapping potential, steepness of the trap, Pe): same as Figure [1(D)] of the main text. Colour code: same as Figure [1(D)] of the main text.

(2) Movie2 : Polar (but not hexagonal) ordering of the self-propelling and self-aligning particles starting from random initial configuration within the circular trap with high steepness. Parameters (packing fraction, strength of rotational fluctuation, strength of trapping potential, steepness of the trap, Pe): same as Figure [1(E)] of the main text. Colour code : same as Figure [1(E)] of the main text.

(3) Movie3 : Spatial (hexagonal) ordering of the self-propelling and self-aligning particles starting from polar (but not hexagonal) initial configuration within the circular trap with slowly varying steepness (from high to low). Parameters (packing fraction, strength of rotational fluctuation, strength of trapping potential, steepness of the trap, Pe): same as Figure [2] of the main text. Colour code : same as Figure [2] of the main text.

(4) Movie4 : Hexagonally ordered polar cluster rotating as well as rolling along the circular boundary of the trap with low steepness (not shown in the movie). Red curve : trajectory of a typical particle within the cluster. Parameters (packing fraction, strength of rotational fluctuation, strength of trapping potential, steepness of the trap, Pe): same as Figure [5(B)] of the main text.

(5) Movie5 : Polar (but not hexagonally ordered) cluster rotating (but not rolling) along the circular boundary of the trap (not shown in the movie) with high steepness. Red curve : trajectory of a typical particle within the cluster. Parameters (packing fraction, strength of rotational fluctuation, strength of trapping potential, steepness of the trap, Pe): same as Figure [5(A)] of the main text.

2 Figures

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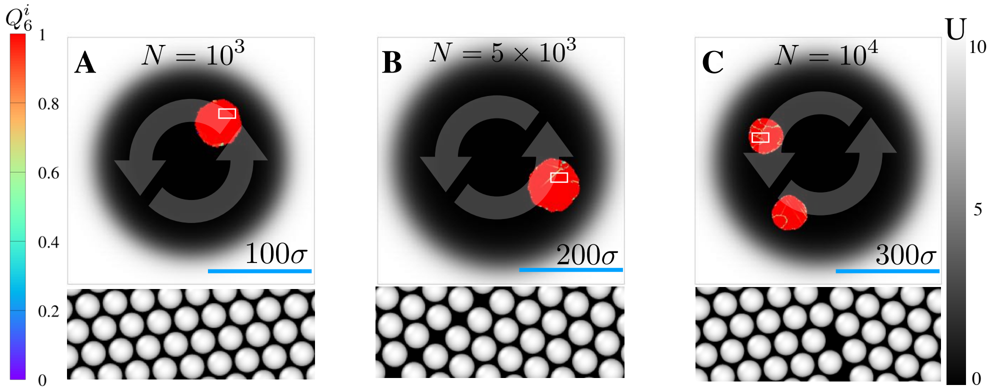

Fig. 1 System size check : Steady states having qualitatively same hexagonal order, emerged from same random initial configuration with Pe=40, $S = 0.1 < S_c = 1.0, \xi = 1/2\pi, \phi = 0.15$ but with three different N.

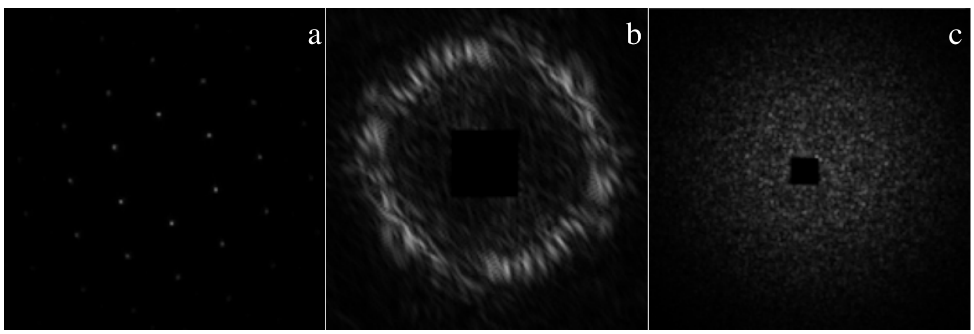

Fig. 2 Structure factors : (a) structure factor $G(\mathbf{k}) = \frac{1}{N}\sum_{ij}\exp(\mathbf{ik}.\mathbf{r}_{ij})$ of the steady-state configuration with hexagonal order, provided in (Fig.1, D) of the main text. (b) structure factor $G(\mathbf{k})$ of the steady-state configuration with liquid-like disorder, provided in (Fig.1, E) of the main text. (c) structure factor $G(\mathbf{k})$ of the steady-state configuration with gas-like disorder, provided in (Fig.1, F) of the main text.

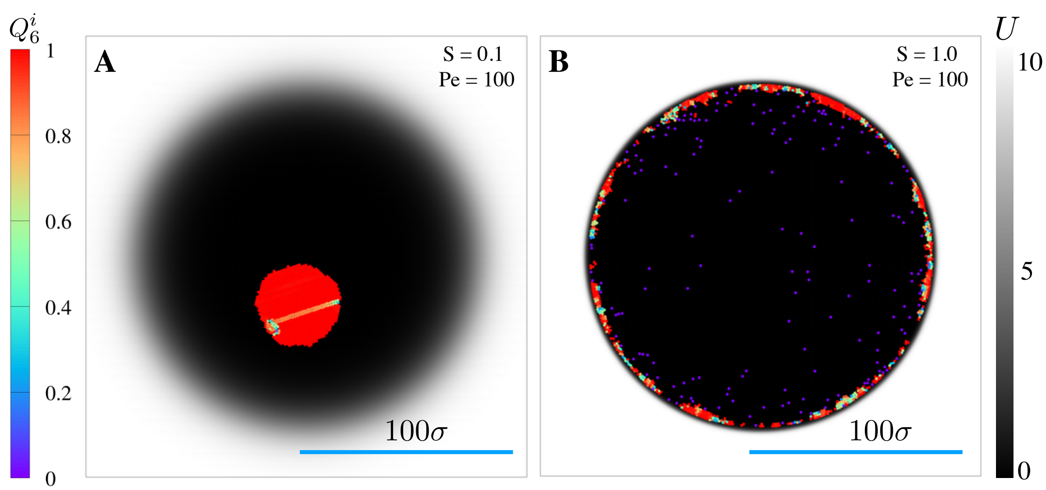

Fig. 3 Configurations with continuum Vicsek dynamics : Simulations are performed with continuous dynamics of the polar angle of the individual particle θ_i as $\frac{d\theta_i}{dt} = \alpha\sum_{j\in S_i}\sin(\theta_j - \theta_i) + \xi$ (following Ref.[17] in the main text), together with the equation of motion, i.e. Eq[4] of the main text. The direction of self-propulsion of the individual particle is given by $\hat{n}_i = \cos\theta_i\hat{x} + \sin\theta_i\hat{y}$ and α determines the strength of the alignment interaction. Here we consider $\frac{\alpha}{\gamma} \simeq 1$.The packing fraction and the strength of the angular noise are same as we have taken for the simulation with the discrete dynamics of $\hat{n}_i$. (A): Spatially (hexagonal) ordered, polar cluster is obtained for low S. (B): Spatially disordered configuration is obtained for high S. RGB scale: Q_6^i. Greyscale: trapping potential.