

## Percolation transitions in the binary mixture of active Brownian particles with different softness: Supplemental information

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### SI-1: Radial distribution function of particles in the dense cluster

We have calculated the radial distribution function of particles in the dense cluster for different values of Pe and particle composition,  $x_h$ .

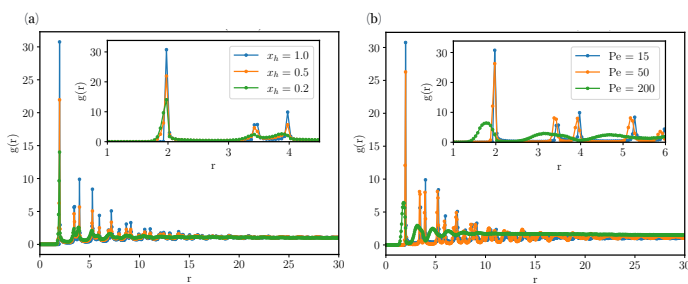


Fig. SI1 The radial distribution function  $g(r)$  calculated for (a)  $Pe = 25$  and for different values of particle compositions,  $x_h$  and (b) for a homogeneous system  $x_h = 1$  and for different values of  $Pe$ .

### SI-2: Detailed Configuration Plots for Various Particle Stiffness and Densities

We have plotted configuration plots for various stiffness levels of hard and soft particles. These configurations are color-coded to represent different characteristics, such as the distribution of the particles, the largest cluster for both soft and hard particles, and local pressure plots.

We have calculated the local interaction pressure in the system using

$$P_i = \frac{1}{N_b} \sum_{j \in N_b[i]} (F(\mathbf{r}_{ij}) \cdot \mathbf{r}_{ij}). \quad (1)$$

Here,  $P_i$  represents the local pressure exerted on the  $i$ -th particle due to the force  $F(\mathbf{r}_{ij}) = k_{eff}(ij) (\sigma - r_{ij}) \hat{\mathbf{r}}_{ij}$  exerted by its neighbors  $N_b$ . This measurement appropriately quantifies the effect of internal stress arising due to interparticle interactions.

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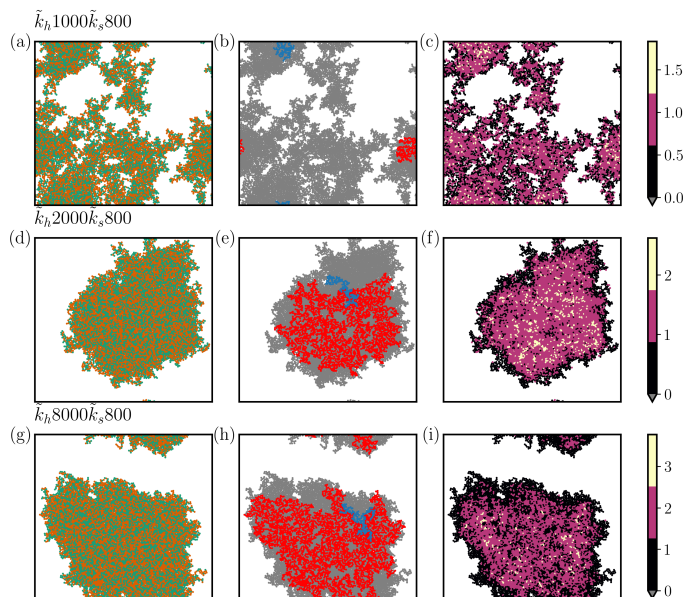


Fig. SI2 Decrease in stiffness of the hard particles: Steady-state configuration plots for various  $\tilde{k}_h$  values for  $\tilde{k}_s = 800$ . (Column 1): Distribution of hard and soft particles. (Column 2): Network of hard particles (red) and soft particles (blue) superimposed on the largest cluster (gray). (Column 3): Local pressure experienced by the particles. These configuration plots are taken at  $Pe = 50$  with  $\phi = 0.7$  and equal composition of hard and soft particles ( $x_1 = x_2$ ).

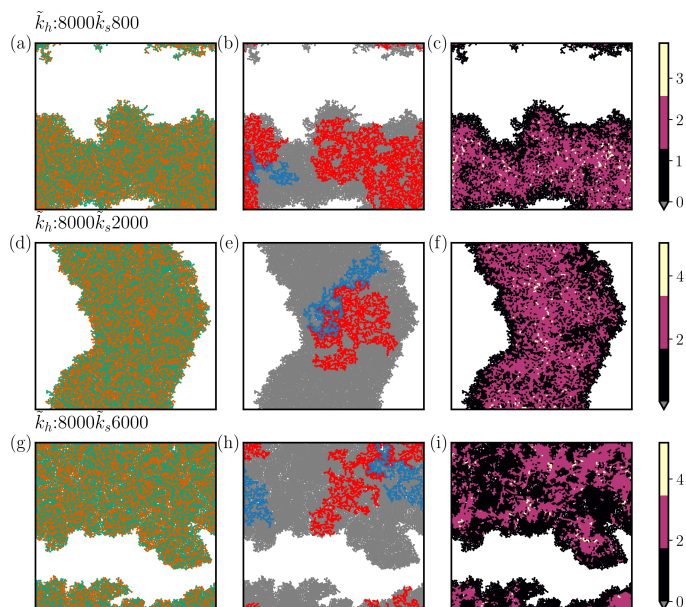


Fig. SI3 Increase in stiffness of the soft particles: Configuration plots for various  $\tilde{k}_s$  values for  $\tilde{k}_h = 8000$ . Color scheme follows as in Fig. SI2. These configuration plots are taken at  $Pe = 50$  with  $\phi = 0.7$  and equal composition of hard and soft particles ( $x_1 = x_2$ ).

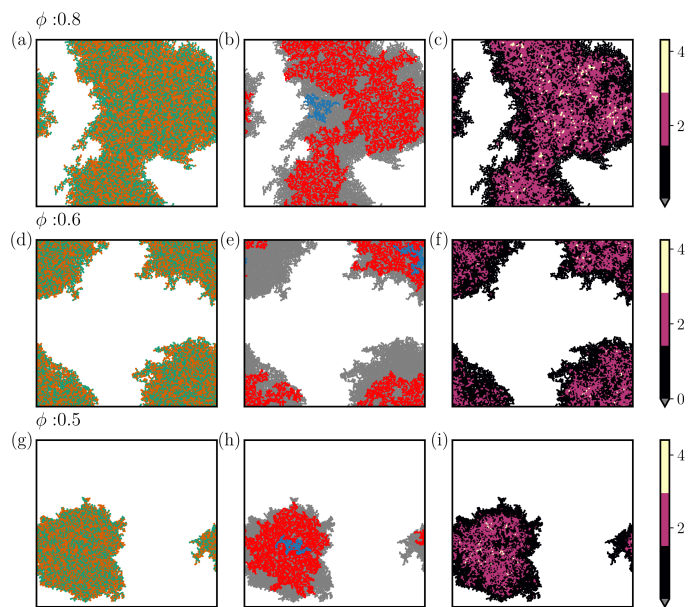


Fig. S14 Effect of density on the cluster properties: Each row shows steady-state configuration plots for various densities. Color scheme in these plots follows as in Fig. S12. These simulations are performed at  $Pe = 50$ ,  $\bar{k}_h = 8000$ ,  $\bar{k}_s = 800$ , and equal composition of hard and soft particles ( $x_1 = x_2$ ).