

Self-assembly of magnetic colloids with shifted dipoles

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Population distributions of greater surface fractions, orientation distributions of low shift as a function of lambda, and radius of gyration as a function of cluster size

Figure S1 shows a comparison of the population distributions for shifts of 0.2, 0.4, and 0.6 at surface fractions of 0.01, 0.02, and 0.05. At the higher surface fractions, more clusters are found in the ground state region of these systems, but cluster-cluster aggregation becomes more common, leading to large clusters composed of multiple smaller clusters.

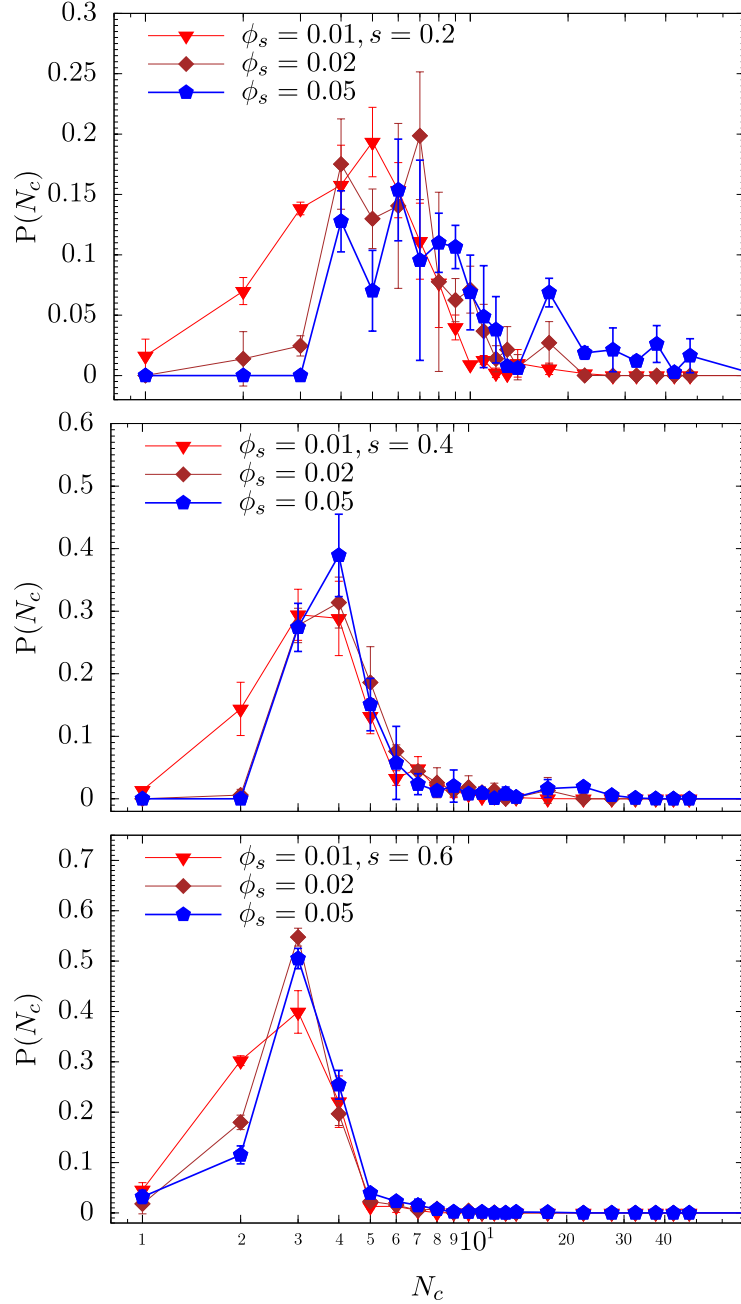


Fig. S1: Effect of surface fraction on cluster size distributions for systems with $s = 0.2, 0.4$, and 0.6 .

Figure S2 shows how the orientation distributions of systems with $s \leq 0.05$ are affected by varying λ . An increase in λ leads to an increased portion of the particles aggregating in a linear fashion as the increasing magnetic interaction potential makes it harder for the thermal fluctuations to bend the dipolar bonds.

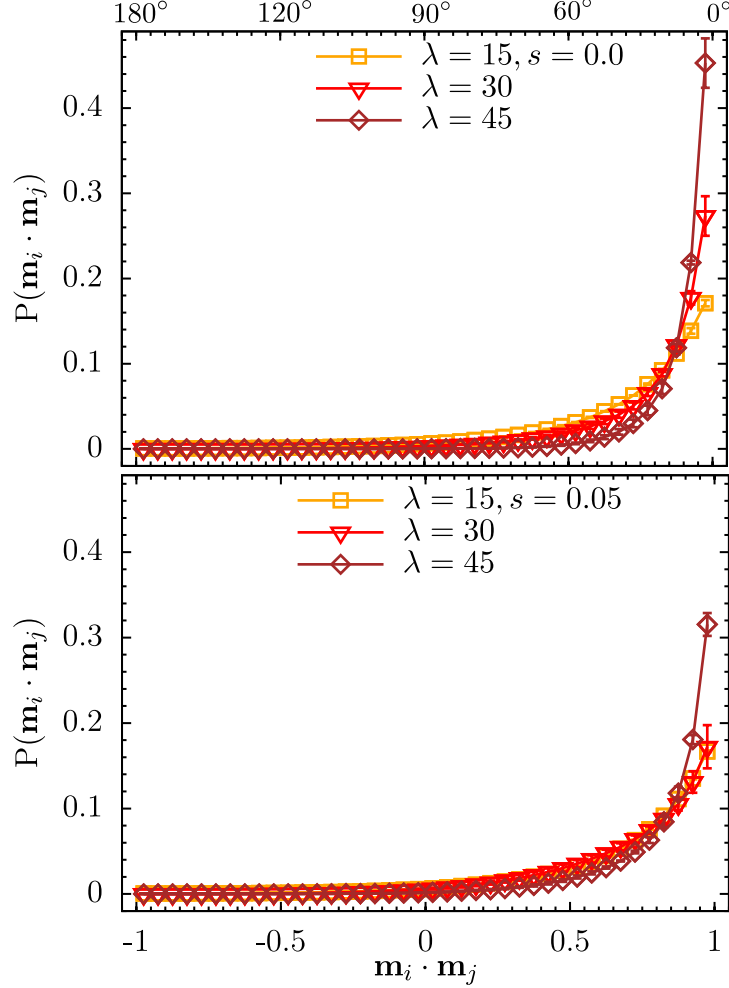


Fig. S2: Effect of λ on orientation distributions for systems with $s = 0.0$ and 0.05 .

Figure S3 shows the weighted radius of gyration of the systems as a function of average cluster size for the same systems as figure 6. The ideal behavior of effective radius for straight chains ($R_{g,chains}$) and ideally circular rings ($R_{g,rings}$), nondimensionalized with the particle radius a , is also plotted. These ideal values were calculated using the following equation:

$$R_g^2 = \frac{1}{N_c} \sum_{i=1}^{N_c} (|\mathbf{r}_i - \mathbf{r}_{cm}|)^2 \quad (1)$$

In general, systems exhibit a behavior between ideal rings and ideal chains, with systems of low shift mostly tending towards chainlike behavior while higher shift systems aggregate with an

exclusively ringlike behavior.

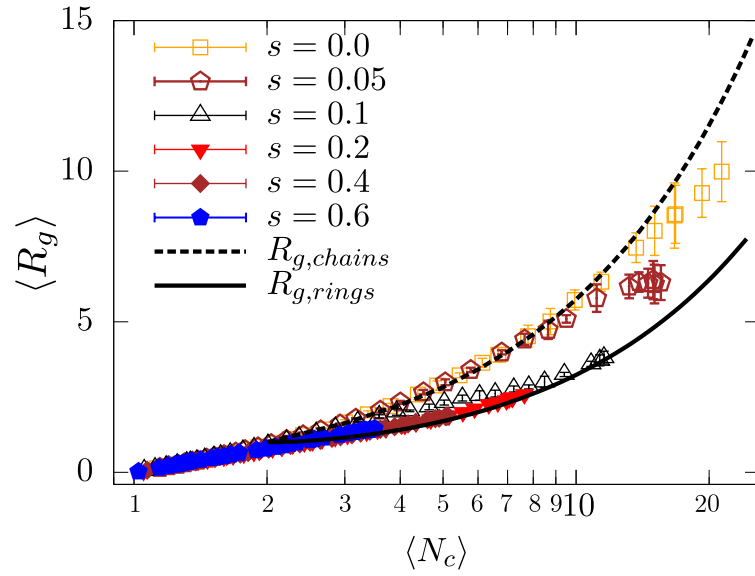


Fig. S3: Radius of gyration as a function of cluster size. Also graphed are the values for ideal chains and ideal rings, as a dashed black line and a solid black line, respectively.

Videos of magnetic Janus particle aggregation

Video Information:

Each video is titled $s_0.X.mov$, where X corresponds to the dipolar shift of the particles present in the video. All systems start with random initial positions and orientations, and have a $\phi_s = 0.01$ and $\lambda = 45$.