Supplementary Material: Transient coarsening and the motility of optically heated Janus colloids in a binary liquid mixture

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Diffusive dynamics

Additional information about the formation of the layers can be gained by inspecting the vector snapshots of the OP flux which is defined as the spatial gradient of $\psi(\vec{r}, t)$ normalized to one. The results shown in Fig. 1 are also depth-averaged but not averaged over initial conditions. One can see the white and red "lines" around the colloid, which correspond to the minima (water-rich layers) and maxima (water-poor depletion layers) of the OP profile, respectively. Following the inverse thermal quench, at first the number of lines increases indicating the formation of surface layers. At later times, the number starts to decrease until at $t = 1000$ one observes only a single depletion layer. At $t = 1000$, away from the colloid the fluid is uniformly mixed as demonstrated by the red and white points.

Figure 2 elucidates the temporal evolution of the order parameter flux around a hydrophilic-hydrophobic colloid.

Hydrodynamic approach

Figures 3 and 4 show the concentration profiles along the x-axis for the hydrophilic-hydrophilic and the hydrophilic-hydrophobic Janus colloid studied in the main text, obtained within the hydrodynamic approach. The centre of the colloid is located at $x = 0$. At early times ($t < 25$), one can see small dips around $x/R = -1$. These dips are due to the weakly hydrophilic wetting condition on the left side of the Janus colloid. In the late stage, this dip is smeared out by the concentration wave arriving from the right side of the Janus colloid.
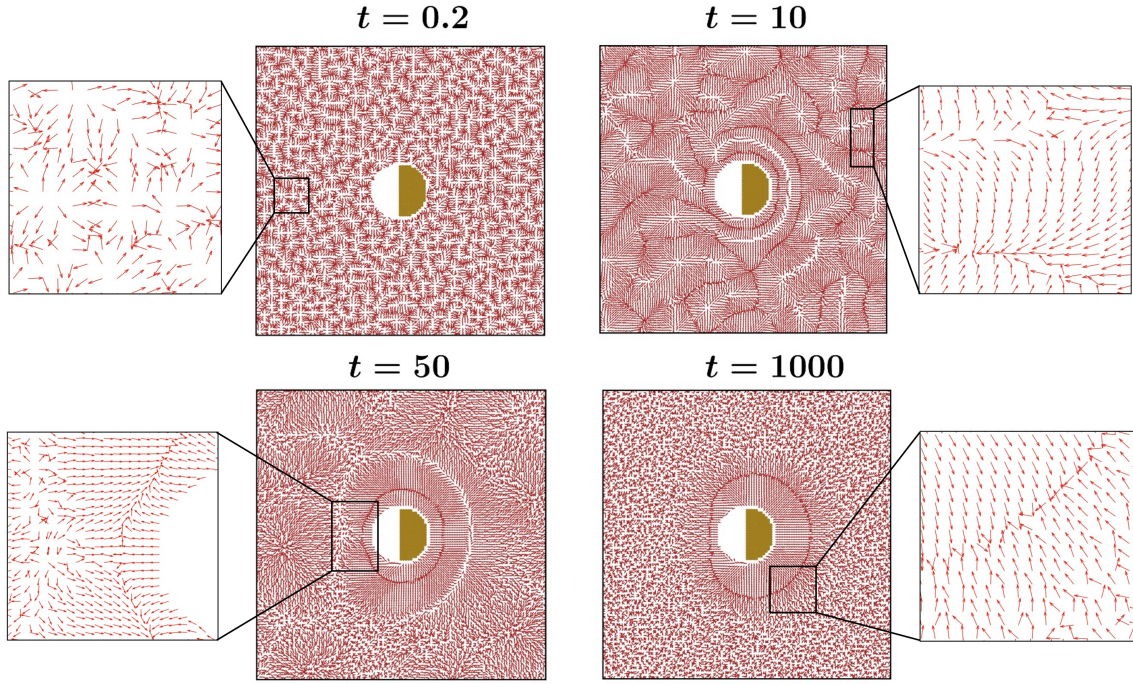
Figure 1: Normalized order parameter flux $\nabla\psi(\mathbf{r}, t)/|\nabla\psi(\mathbf{r}, t)|$ around the *hydrophilic-hydrophilic* Janus colloid studied in the main text. Time is given in units of $t_0 = 10^{-6}$s. The set of parameters is the same as for Fig. 5 in the main text. The flux of the OP is colored differently than $\psi(\mathbf{r}, t)$ in Fig. 5 in the main text.
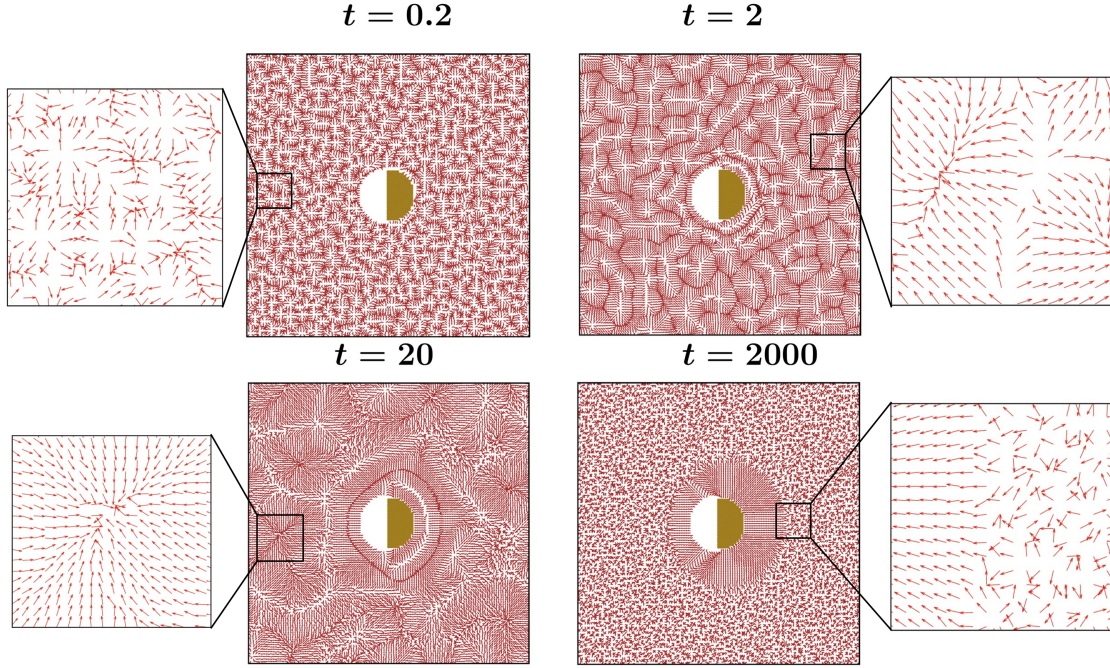
Figure 2: Normalized order parameter flux $\nabla\psi(\mathbf{r}, t)/|\nabla\psi(\mathbf{r}, t)|$ around the *hydrophilic-hydrophobic* Janus colloid studied in the main text. The temporal development is similar to the one for the hydrophilic-hydrophilic particle shown in Fig. 1 of SM, but the steady state is different. It reflects the formation of a droplet rich in water on the left side of the Janus particle, which is missing in Fig.1 in SM for $t = 1000$. Time is given in units of $t_0 = 10^{-6}$s. The set of parameters is the same as for Fig. 7 in the main text. The flux of the OP is colored differently than $\psi(\mathbf{r}, t)$ in Fig. 7 in the main text.
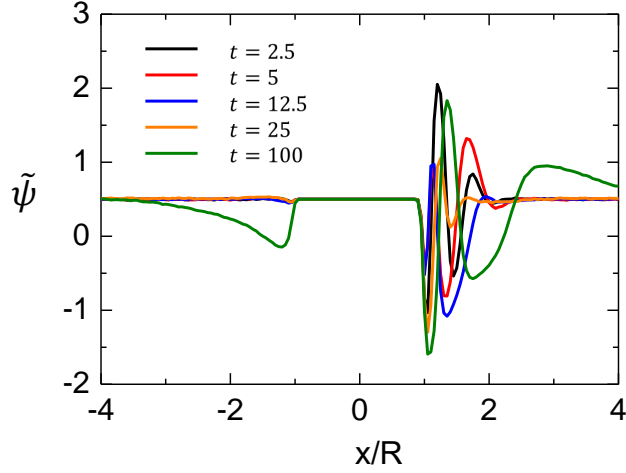
Figure 3: Evolution of the rescaled concentration profile $\tilde{\psi}(\mathbf{r}, t) = (\psi(\mathbf{r}, t) + 1)/2$ along the x-axis around the *hydrophilic-hydrophilic* Janus colloid studied in the main text as function of the distance x/R from the center of the colloid, corresponding to the snapshots shown in Fig. 11(a) in the main text. In Fig. 13 in the main text we show these profiles in full detail and in an expanded interval of x, corresponding to the right side of the Janus particle, i.e., for $x/R > 1$. At short times the concentration profile near the left (uncapped) side of the Janus colloid is slightly negative. This is the case because the left hemisphere is weakly hydrophilic. At late times the profile on this side of the Janus particle is dominated by the concentration wave arriving from the heated right hemisphere. In the case of the hydrophilic right side, this concentration wave drives the profile close to the left side even more negative. The time is given in units of $t_0 = 10^{-6}$s. The initial bulk value $\tilde{\psi}(x \to \infty) = 0.5$.
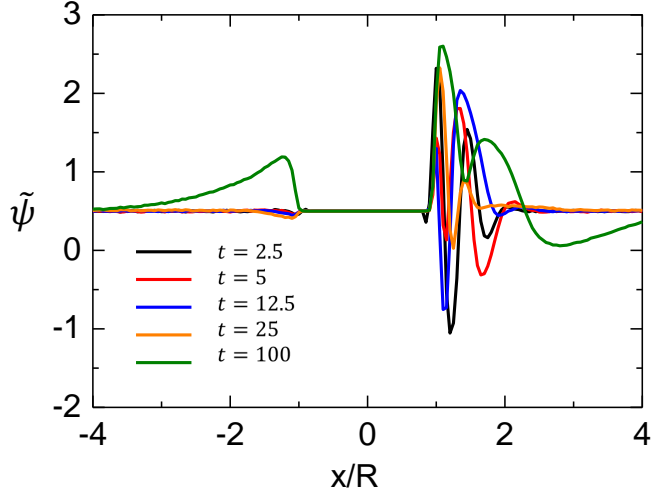
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Figure 4: Evolution of the rescaled concentration profile $\tilde{\psi}(\mathbf{r}, t) = (\psi(\mathbf{r}, t) + 1)/2$ along the x-axis around the *hydrophilic-hydrophobic* Janus colloid studied in the main text as function of the distance x/R from the center of the colloid, corresponding to the snapshots shown in Fig. 11(b) in the main text. In Fig. 14 in the main text we show these profiles in full detail and in an expanded interval of x, corresponding to the right side of the Janus particle, i.e., for $x/R > 1$. As in Fig. 3, at short times the concentration profile near the left (uncapped) side of the Janus colloid is slightly negative. This is the case because the left hemisphere is weakly hydrophilic. At late times the profile at this side of the Janus particle is dominated by the concentration wave arriving from the heated right hemisphere. In the case of the hydrophobic right side, near the left side this concentration wave drives the profile positive. The time is given in units of $t_0 = 10^{-6}$s. The initial bulk value $\tilde{\psi}(x \to \infty) = 0.5$.