

Supplementary Information

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(Dated: February 8, 2022)

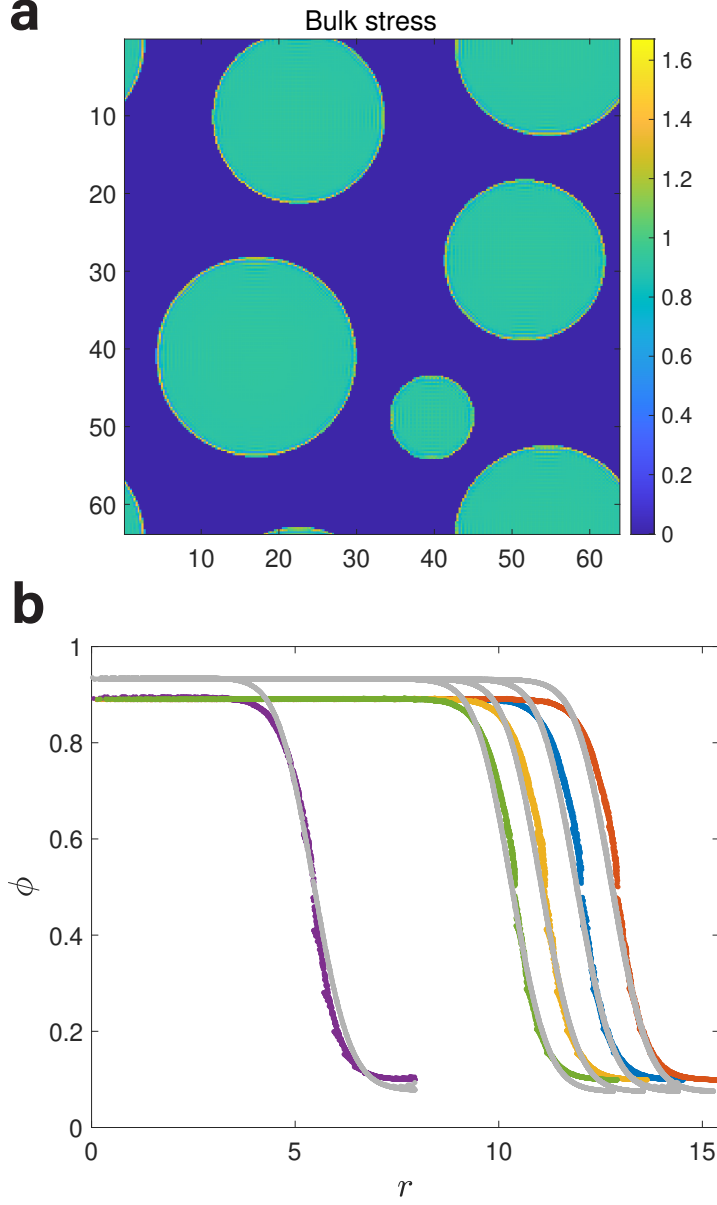


FIG. S1. Numerical verifications of constant bulk stress and constant radii. (a) The bulk stress σ_B after decreasing χ from 3.0 to 1.5. (b) The initial ϕ are plotted as gray dots and the final ϕ are colored dots, which demonstrates that the radii are approximately invariant. This simulation is the same as Figure 2 in the main text.

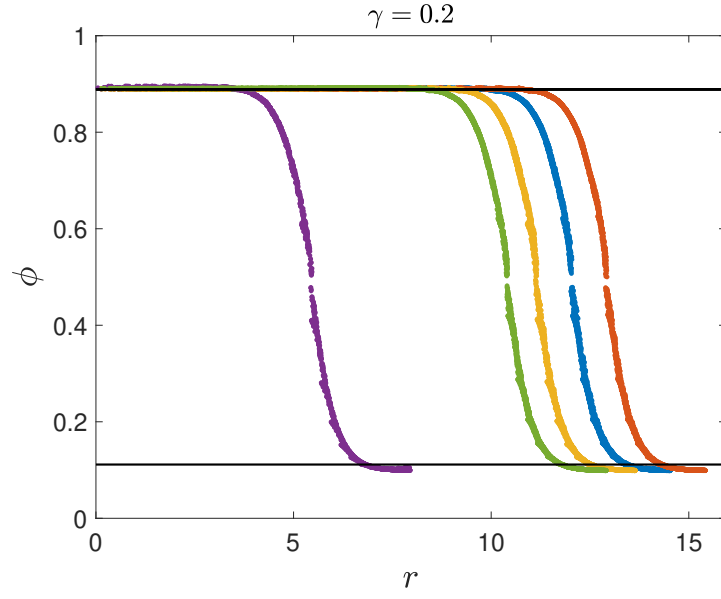


FIG. S2. Theoretical predictions of ϕ assuming $\gamma = 0.2$ (black lines), which are very close to the ones in Figure 3b with $\gamma = 0$.

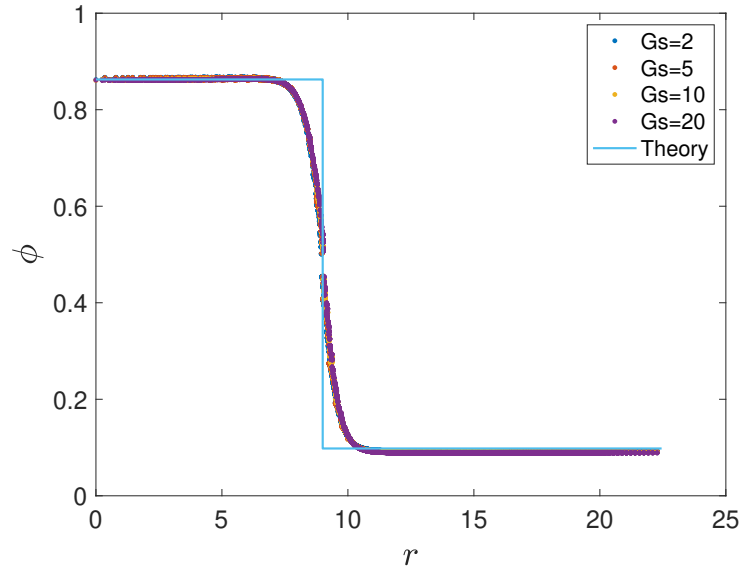


FIG. S3. Simulation results are insensitive to the shear modulus G_S . The density fields ϕ with different G_S are plotted as colored dots, which are almost overlapped showing that the shear modulus rarely affects the simulation results. Here, we take $R_0 = 9$, $G_B = 10$, and $\phi_c = 0.5$.

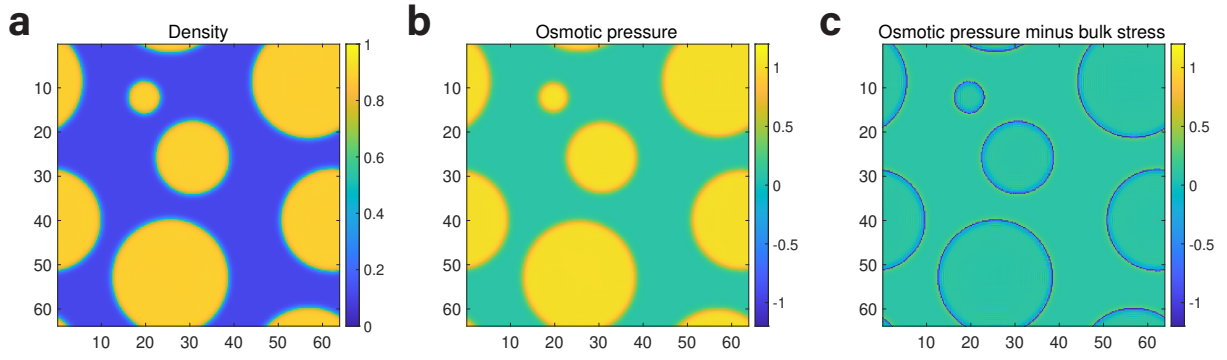


FIG. S4. Simulations of multiple coexisting condensates. (a) The density field ϕ after decreasing χ from 3.0 to 1.5. (b) The osmotic pressure Π from the same simulation of (a). (c) $\Pi - \sigma_B$ from the same simulation of (a). In the simulations of this figure, we take $\phi_0 = 0.45$, $G_B = 20$, $G_S = 20$, and $\phi_c = 0.6$.

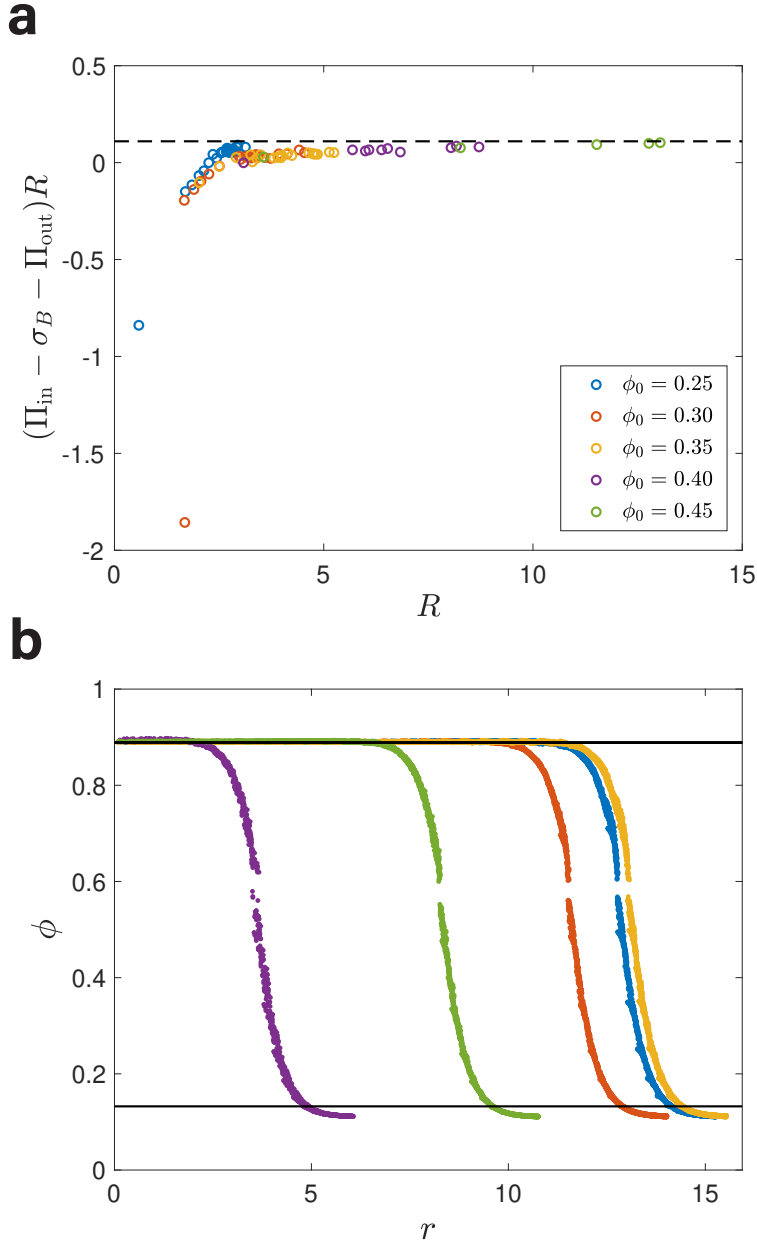


FIG. S5. Computations of the surface tension constant γ and predictions of the density field, similar to Figure 3 while $\phi_c = 0.6$. (a) The inferred surface tension constant $\gamma = (\Pi_{\text{in}} - \sigma_B - \Pi_{\text{out}})R$ approaches an asymptotic value in the large radius limit. (b) A comparison of the theoretical predictions of ϕ (black lines) and the simulations in Figure S4(a) (colored dots). In both (a) and (b), $G_B = 20$, $G_S = 20$, $\phi_c = 0.6$, $\chi_i = 3.0$, $\chi_f = 1.5$. In (b), $\phi_0 = 0.45$.

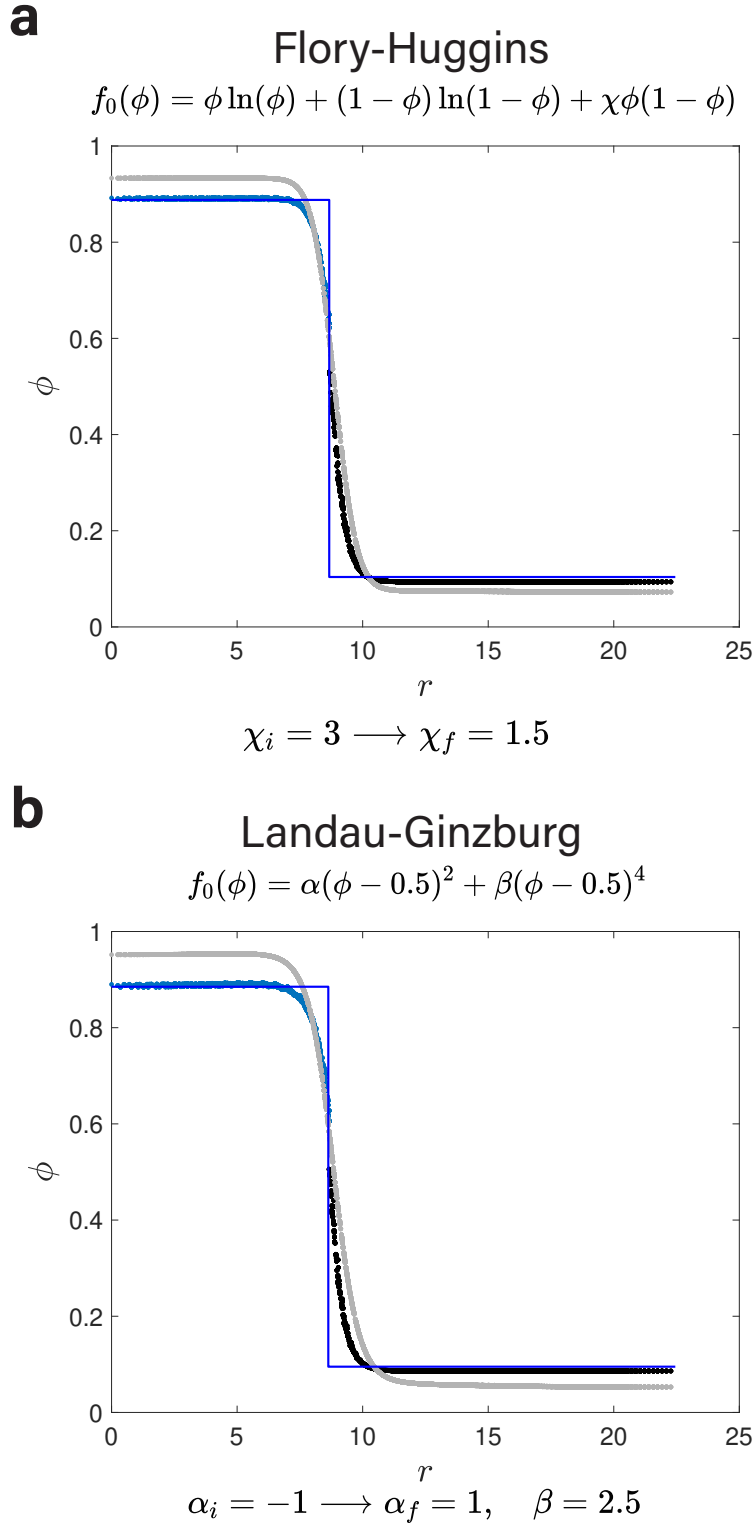


FIG. S6. Simulations using different types of free energy. (a) For the Flory-Huggins free energy, when the control parameter χ decreases from 3.0 to 1.5, the initial density field (gray dots) cannot be maintained and the final density field is established (blue dots). The blue line is the theoretical prediction based on the equilibrium conditions of elastic condensates. (b) For the Landau-Ginzburg free energy, the control parameter α increases from -1 to 1 , and the equilibrium density field can also be predicted by our theories. In both (a) and (b), a single condensate is simulated, and $G_B = 20$, $G_S = 20$, $\phi_c = 0.6$, $R_0 = 9$.

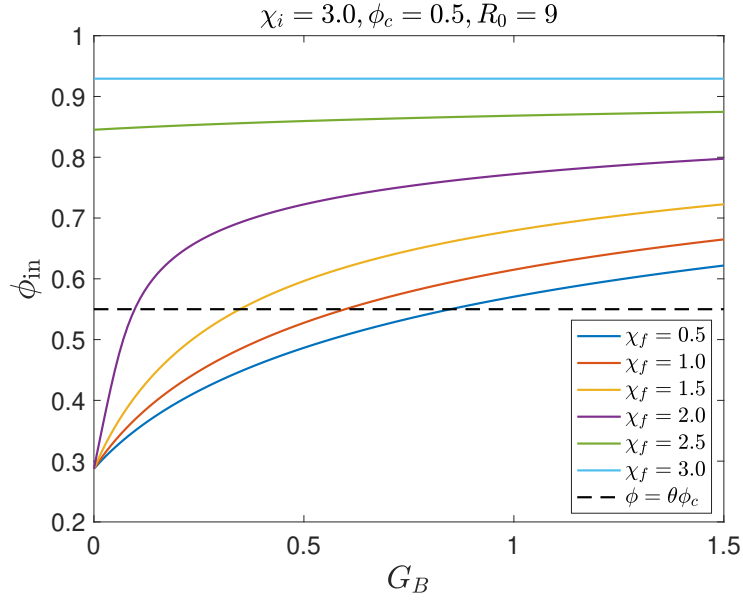


FIG. S7. The theoretical predicted ϕ_{in} with G_B under different χ_f . For a fixed χ_f , ϕ_{in} decreases with lowered G_B , which demonstrates that there exists a critical $G_{B,c}$ only above which the elasticity can be maintained. In the theoretical predictions, we consider a single condensate with $\chi_i = 3$, $R_0 = 9$, $\gamma = 0$, and $\phi_c = 0.5$ to obtain ϕ_{in} .

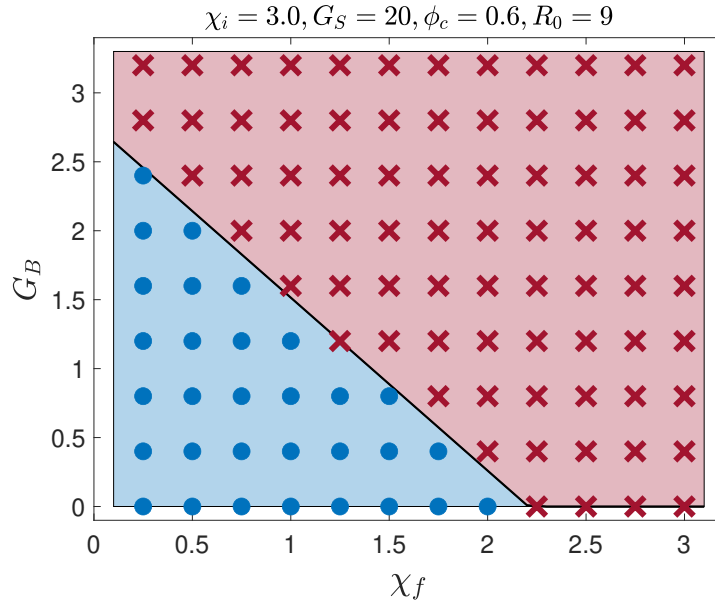


FIG. S8. Phase diagram of condensate stability with control parameters χ_f and G_B . The theoretical predicted $G_{B,c}$ is the black line and the simulation results are the blue dots and red crosses. In this figure, $\phi_c = 0.6$, and the theoretical prediction is obtained with $\theta = 1.1$.

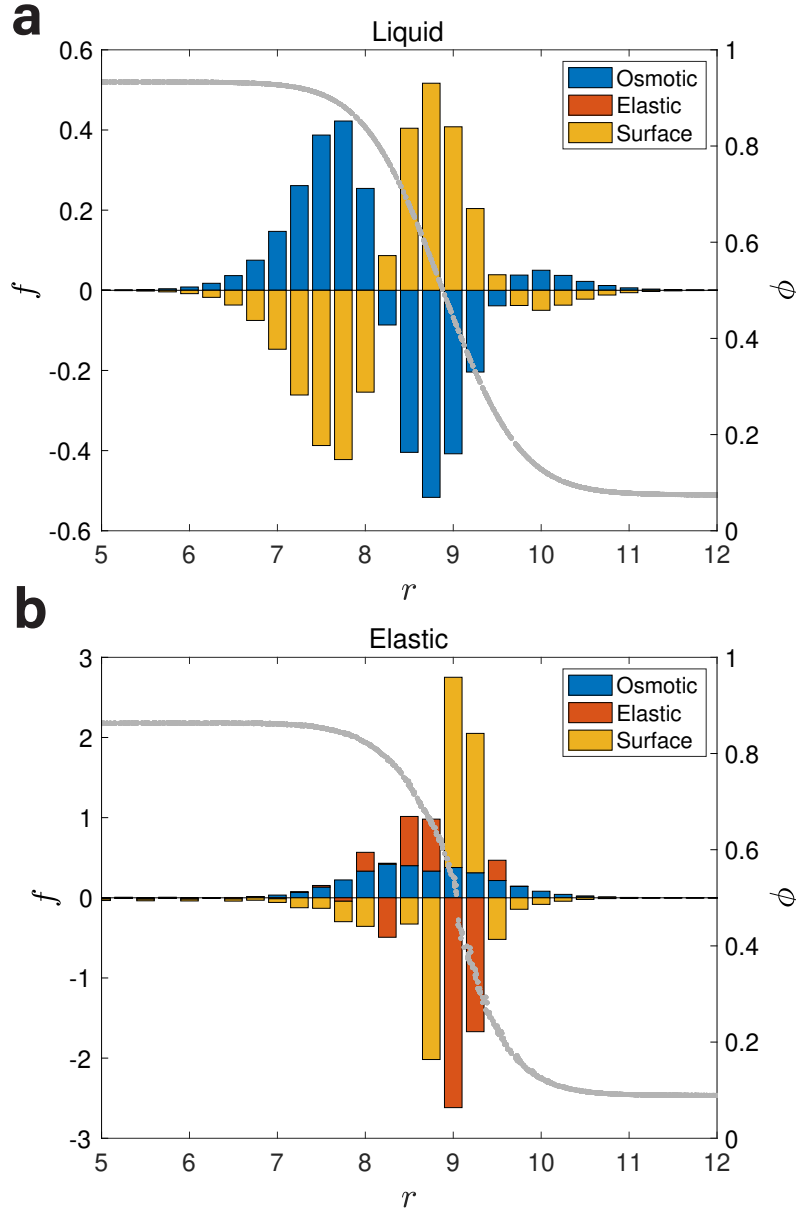


FIG. S9. The force distribution from numerical simulations on the surface of a condensate where a positive (negative) value means an outward (inward) force. (a) The force distributions for a liquid condensate including the osmotic force and the surface tension force, which are separated into three parts. The osmotic force is inward in the second part. (b) The force distributions for an elastic condensate including the osmotic force, the elastic force and the surface tension force, which are roughly separated into three parts. The elastic force is inward in the second part to balance the outward osmotic force. In this simulation, we take $R_0 = 9$, $\chi = 3$ for (a), and $\chi = 1.5$, $G_B = 10$, $G_S = 20$ and $\phi_c = 0.5$ for (b).