Captions for SI videos

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The attached four videos display examples of the pattern formation described in the main text. In all movies the color scale is as given in Fig. 5 and refers to the value of the local cell shape anisotropy $m(\mathbf{x}, t)$, with $m = 0$ (white) corresponding to a solid and $m \neq 0$ (blue to green) to a liquid. The red arrows represent local polarization $\mathbf{p}(\mathbf{x}, t)$, with the length of the arrows proportional to the magnitude of polarization. The four movies correspond to the states labeled $A - D$ in the phase diagram of Fig. 5. Each simulation is initialized in the steady state predicted by the mean field theory for the corresponding values of parameters, with a superimposed small spatially uncorrelated noise. For states B, C, and D the initial polarization is chosen to point vertically up. Each simulation is run with parameters (a, s_0, ν) specified individually in the caption, parameters $(\alpha_p^0, \mathrm{D}, \mathrm{D}_p) = 0.5$ and all other parameters set to one, reflecting the analysis in the main text.

a. *SI Video 1: phase point A in Fig 5* The video displays the formation of liquid droplets in a solid matrix. The polarization is directed from the fluid to the solid. It is largest at the solid-fluid boundary and forms outward pointing asters, corresponding to positive splay.

b. *SI Video 2: phase point B in Fig 5* The video displays the formation of solid islands in a liquid matrix. The polarization is directed from the fluid to the solid. It is largest at the solid-fluid boundary and forms inward pointing asters, corresponding to negative splay. Here $a = 1.5$, $s_0 = 4.15$ and $\nu = 1$.

c. *SI Video 3: phase point C in Fig 5* The video displays the formation of liquid bands in a solid matrix, with polarization directed normal to the long direction of the bands and pointing from the liquid to the solid. Here $a = 2.5$, $s_0 = 3.9$ and $\nu = 1$.

d. *SI Video 4: phase point D in Fig 5* The video displays the formation of liquid bands traveling in a solid matrix. There is a net polarization normal to the long direction of the bands that travel in the direction opposite to that of mean polarization.This is reminiscent of “traffic shockwaves”, where a low density region of cars in a traffic jam is found to travel opposite to the direction of traffic flow. Here $a = 3.5$, $s_0 = 3.88$ and $\nu = -1$.