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## Supplementary Materials for

### **Transformation between elastic dipoles, quadrupoles, octupoles, and hexadecapoles driven by surfactant self-assembly in nematic emulsion**

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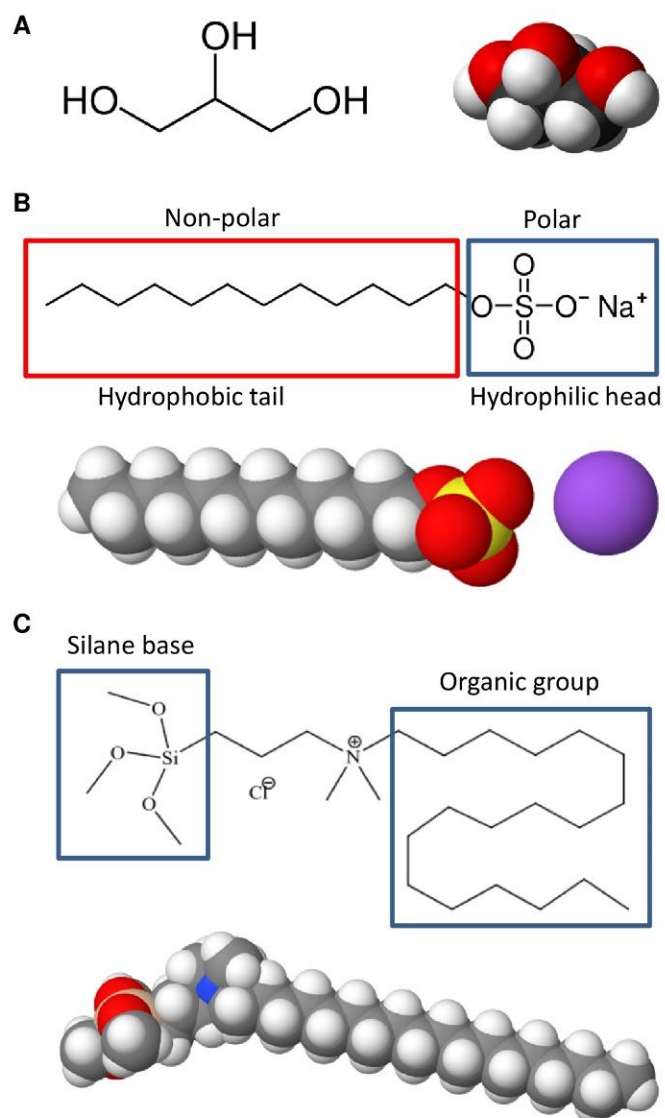
#### **The PDF file includes:**

Figs. S1 to S3  
Legends for movies S1 to S5

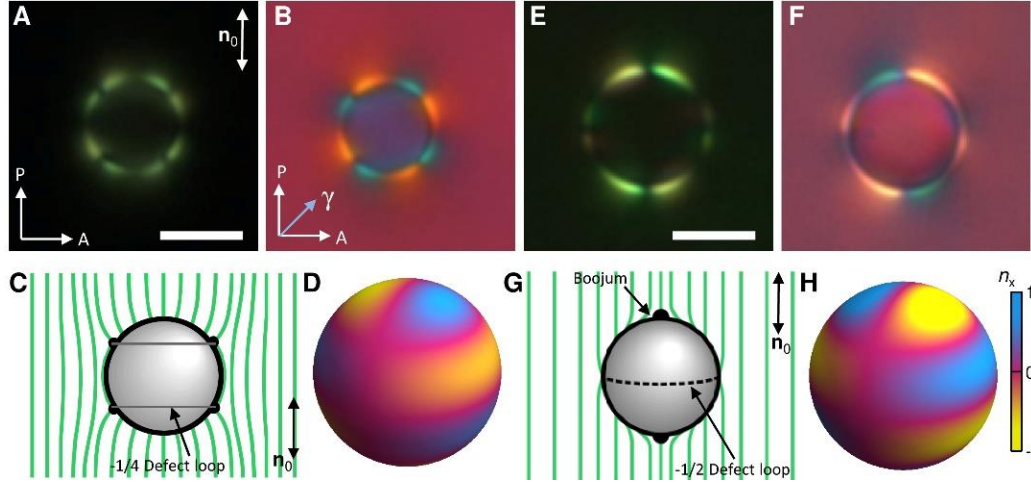
#### **Other Supplementary Material for this manuscript includes the following:**

(available at [advances.sciencemag.org/cgi/content/full/7/25/eabg0377/DC1](https://advances.sciencemag.org/cgi/content/full/7/25/eabg0377/DC1))

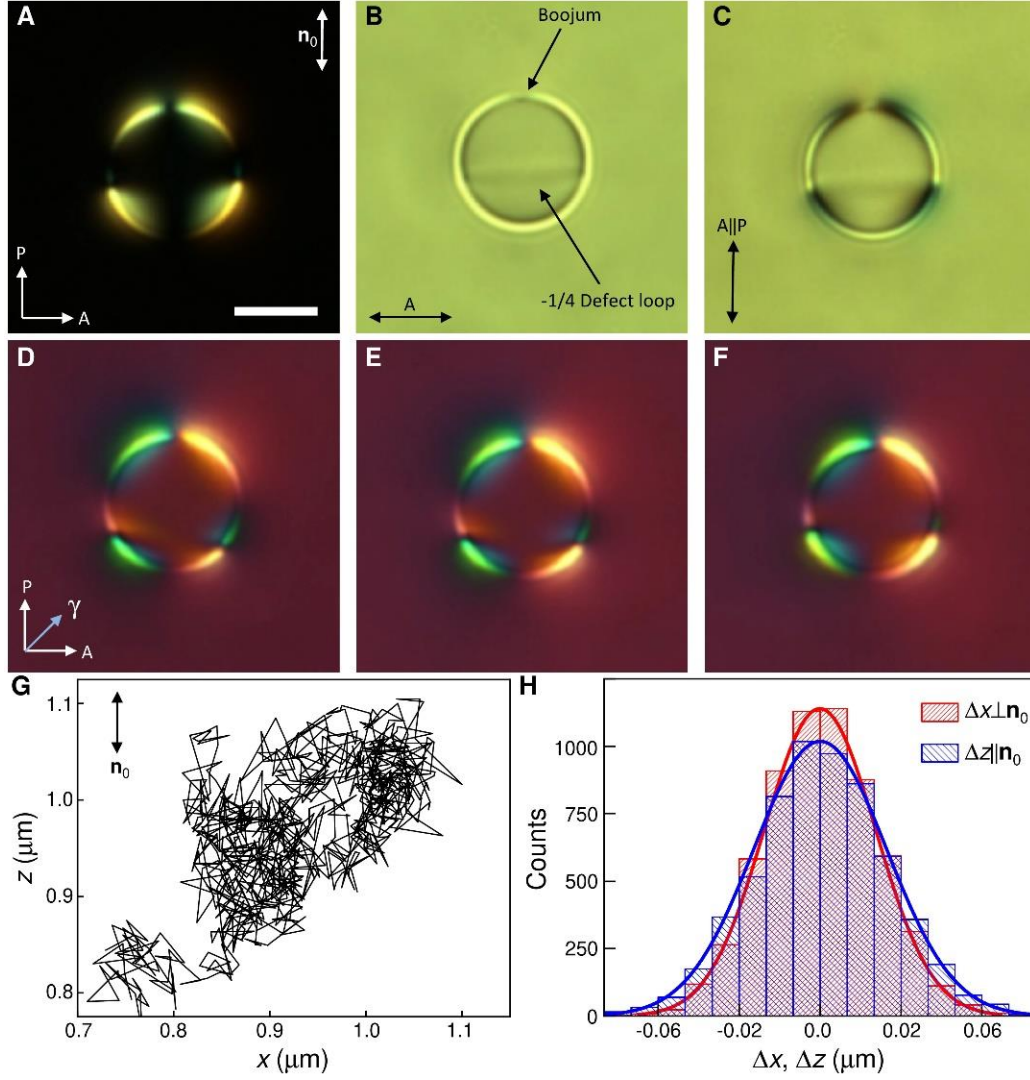
Movies S1 to S5



**Fig. S1.** Composition of droplets: (A) Glycerol; (B) Sodium dodecyl sulfate (SDS); (C) N,N-dimethyl-N-octadecyl-3-aminopropyl-trimethoxysilyl chloride (DMOAP).



**Fig. S2.** Comparison of the elastic hexadecapoles with (A-D) mixed planar-homeotropic and (E-H) conically degenerate surface anchoring. Scale bars, 5  $\mu\text{m}$ .



**Fig. S3.** Elastic octupoles and their Brownian motion: (A-F) Optical micrographs between crossed polarizers (A, D-F) without (A) and with (D-F) a retardation plate and between parallel polarizers (C) and without a polarizer (B). (G) Trajectory of the octupole's Brownian motion obtained at a frame rate of 15 fps. (H) Histogram of octupole's displacements with respect to  $\mathbf{n}_0$ . Scale bars, 5  $\mu\text{m}$ .

**Movie S1.**

Optical microscopy textures during a transition from a boojum quadrupole to hedgehog dipole. Timer shows the elapsed time of transformations. P and A mark crossed polarizer and analyzer and  $\mathbf{n}_0$  is a far-field director.

**Movie S2.**

Computer simulations of a transition from a boojum quadrupole to Saturn ring quadrupole: (A) director field configurations with red regions showing the reduced scalar order parameter  $S = 0.3$ ; (B) elastic multipoles shown as a color map of the director's  $x$ -component ( $n_x$ ) on the shell enclosing the droplet and defects. The radius of a mapping shell is  $1.2r_0$ ; (C) polarizing microscopy textures; P and A mark crossed polarizer and analyzer and  $\mathbf{n}_0$  is a far-field director.

**Movie S3.**

Computer simulations of a transition from a boojum quadrupole to octupole: (A) director field configurations with red regions showing the reduced scalar order parameter  $S = 0.3$ ; (B) elastic multipoles shown as a color map of the director's  $x$ -component ( $n_x$ ) on the shell enclosing the droplet and defects. The radius of a mapping shell is  $1.2r_0$ ; (C) polarizing microscopy textures; P and A mark crossed polarizer and analyzer and  $\mathbf{n}_0$  is a far-field director.

**Movie S4.**

Computer simulations of a transition from a dipole to a boojum quadrupole: (A) director field configurations with red regions showing the reduced scalar order parameter  $S = 0.3$ ; (B) elastic multipoles shown as a color map of the director's  $x$ -component ( $n_x$ ) on the shell enclosing the droplet and defects; (C) polarizing microscopy textures; P and A mark crossed polarizer and analyzer and  $\mathbf{n}_0$  is a far-field director.

**Movie S5.**

Computer simulations of a director field change during a transformation of a defect loop into a boojum and the subsequent formation of a semi-ring of disclination corresponding to the boojum core. A red isosurface depicts a region with the reduced scalar order parameter  $S = 0.3$ .