MATERIALS SCIENCE

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

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Emulsions comprising isotropic fluid drops within a nematic host are of interest for applications ranging from biodetection to smart windows, which rely on changes of molecular alignment structures around the drops in response to chemical, thermal, electric, and other stimuli. We show that absorption or desorption of trace amounts of common surfactants can drive continuous transformations of elastic multipoles induced by the droplets within the uniformly aligned nematic host. Out-of-equilibrium dynamics of director structures emerge from a controlled self-assembly or desorption of different surfactants at the drop-nematic interfaces, with ensuing forward and reverse transformations between elastic dipoles, quadrupoles, octupoles, and hexadecapoles. We characterize intertransformations of droplet-induced surface and bulk defects, probe elastic pair interactions, and discuss emergent prospects for fundamental science and applications of the reconfigurable nematic emulsions.

INTRODUCTION

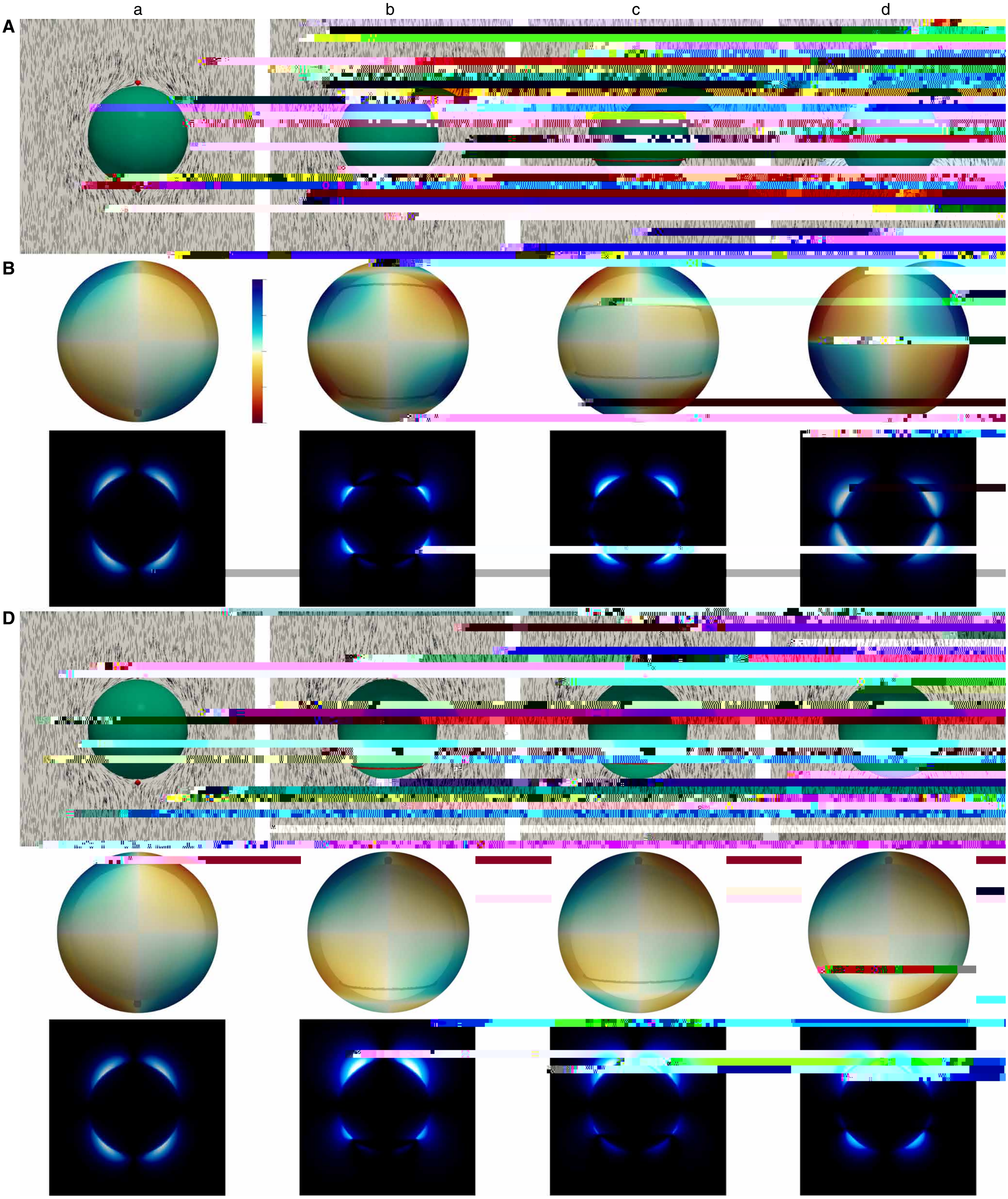
n(r)- (16, 31) n(r)- (17, 19) (17, 18)

(7, 13, 21, 34).

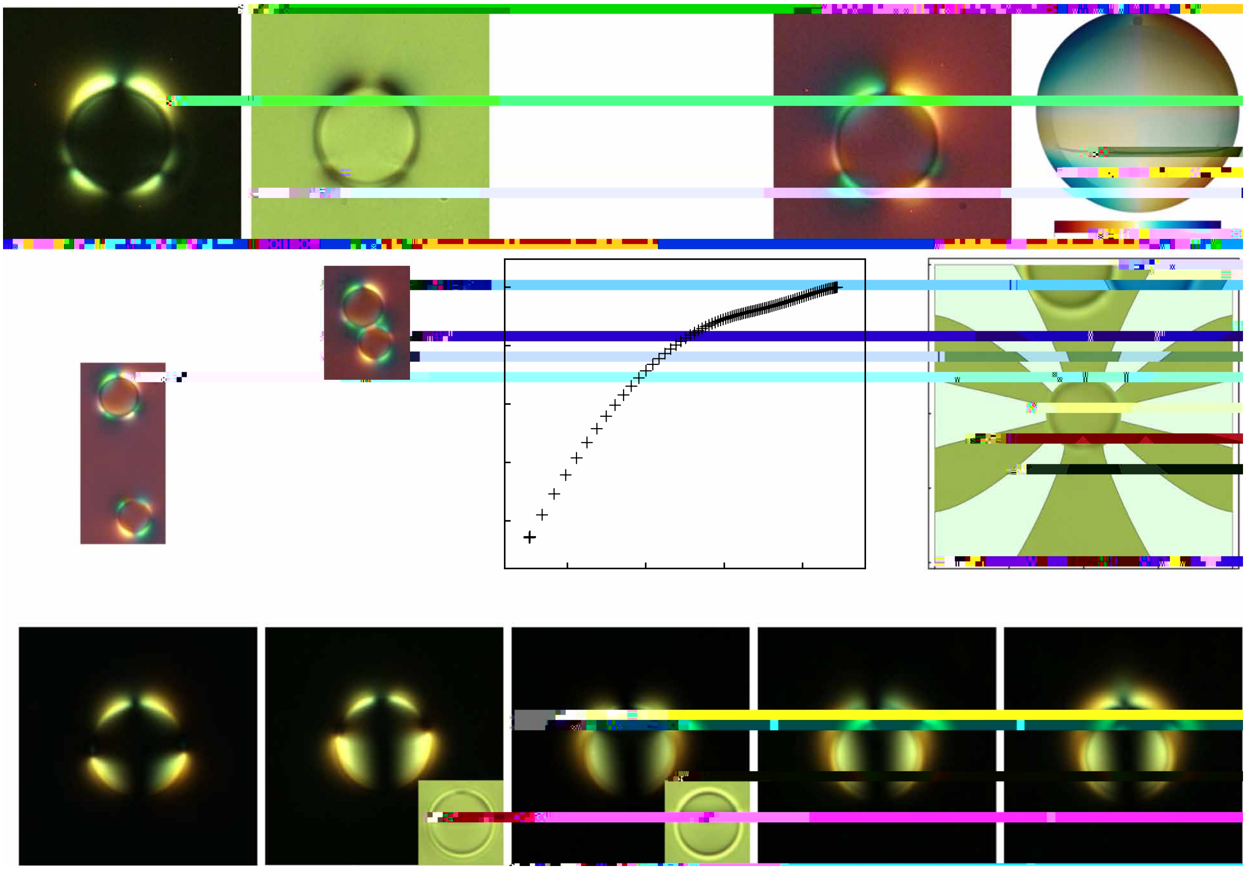
Ela ic he adecapole i h mi ed pa ch anchoring

(17, 19, 31).

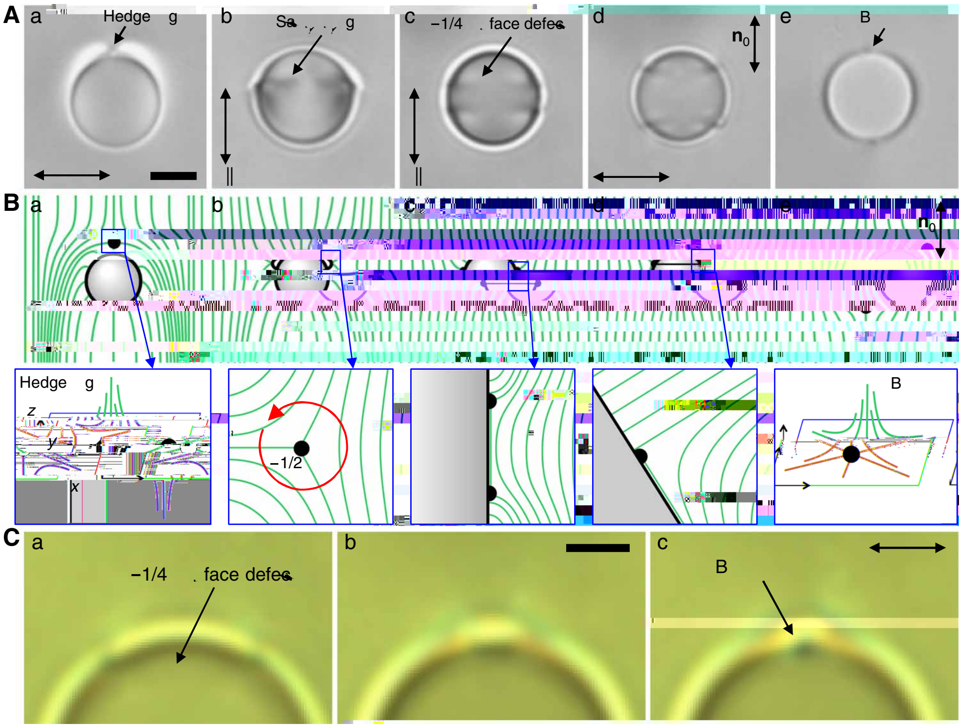
(7, 25).


a
b
c
d
A
B
D

Ela ic oc pole i h mi ed ancho ing



Topological an fo ma ion f om hedgehog dipole o booj m q ad pole


A
a
b
c
d
e
−1/4
n_0
B
−1/2
z
y
x
C

F ion, pli ing, and o her ran formation of ing lar defec

[illegible] (2, 3, 13, 22, 23). [illegible] (2, 3, 13, 22, 23), [illegible]

DISCUSSION

MATERIALS AND METHODS

Sample preparation and imaging technique

[illegible]

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