Materials Research Science and Engineering Centers (Princeton MRSEC 1420541)

DMR MRSEC Program

Phase behavior of multi-component liquid mixtures

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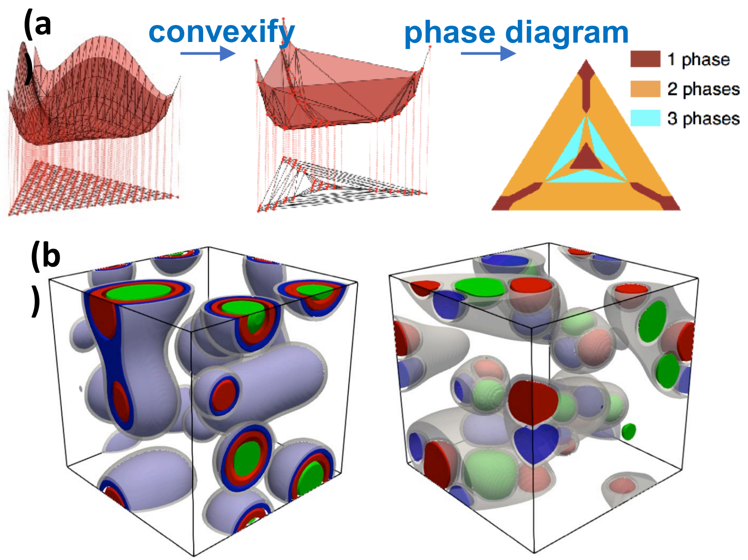

Fig. 1. Phase behavior of multi-component liquid mixtures. a) Procedure for constructing phase diagrams via convexification of the discretized free energy function. Example shows the phase diagram construction for mixture with N=3 components; the procedure was also generalized to mixture with N>3 components. b) Reverse engineered nested morphologies for mixtures with *N*=5 components. Left: "Russian doll" droplets; Right: encapsulated emulsions. Figure adapted from Mao *et. al.*, Soft Matter, 2019.

Electrostatically-driven spontaneous fiber wrapping

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Self-assembly generally studied at nanometer and colloidal length scales.

Here: Microfluidic fabrication, experiments and theory to study assembly of oppositely charged soft components at 10s – 100s microns.

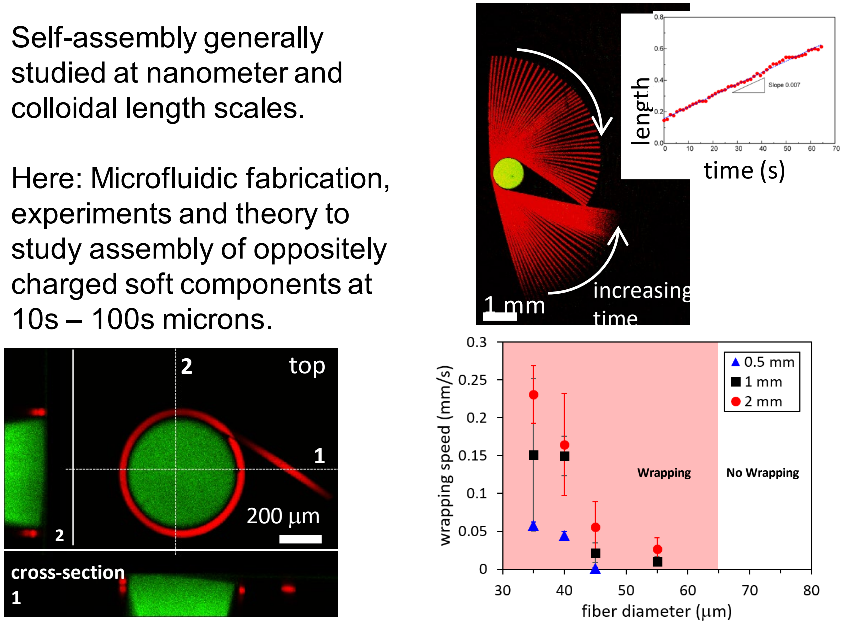

Fig. 2. Spontaneous fiber wrapping of a charged hydrogel microfiber onto an oppositely charged hydrogel disk in an aqueous environment. (a) Overlaid time sequence of wrapping behavior of a microfiber around a single disk-shaped particle with adjacent graph showing adhered fiber length varying linearly with time. (b) Final wrapped aggregate from (a)., with different orientation shown. (c) Rate of wrapping increases with increasing disk diameter and decreasing fiber diameter (also, decreases with increasing concentration of NaCl in solution [data not shown]).

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SuperSeed-8: Engineering of Structured Soft Materials

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