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# Adhesion hierarchy and mechanical stress drive the organization of biomimetic emulsions

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Biological tissues remodelling occurs through bio-chemical signalling and mechanical processes. In such complex biological systems, unravelling the contribution of a given parameter, for instance cell-cell adhesion regulation, therefore represents a huge challenge. In order to work in a simplified framework, we use adhesive emulsions as a biomimetic system of adhesive tissues, where each oil droplet mimics a cell in the tissue and droplets can adhere to each other through specific (DNA bonds) or non-specific (Biotin-Streptavidin bonds) interactions to mimic cell-cell adhesion. At equilibrium, we can correlate the deformation of the droplet with the binding energy, which is given by the length of the strand in the case of DNA-driven interactions.

We focus on how this interdroplet adhesion modulates the response of our biomimetic tissues under mechanical perturbations such as those encountered during development. We thus study the elastoplastic response of the emulsion as a function of the tuneable binding energy, interaction hierarchy, and applied stress.
To do so, we flow dense emulsions in a microfluidic constriction where the geometry of the channel determines the stress field applied to the system. In particular, introducing a binding energy differential in the packing, we try to uncover the influence of the applied stress combined with the adhesion hierarchy over the rearrangements that occur in the packing at the local scale. We also explore the emergence of self-organization as a function of adhesion when the emulsions are submitted to repeated mechanical perturbations.

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