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Biomimetic DNA emulsions: specific, thermo-reversible and adjustable binding from a liquid-like DNA layer LEA-LAETITIA PONTANI, LANG FENG, Department of Physics, New York University, REMI DREYFUS, Complex Assemblies of Soft Matter, Centre National de la Recherche Scientifique-Rhodia-University of Pennsylvania, NADRIAN SEEMAN, Department of Chemistry, New York University, PAUL CHAIKIN, JASNA BRUJIC, Department of Physics, New York University — We develop micron-sized emulsions coated with specific DNA sequences and complementary sticky ends. The emulsions are stabilized with phospholipids on which the DNA strands are grafted through biotin-streptavidin interactions, which allows the DNA to diffuse freely on the surface. We produce two complementary emulsions: one is functionalized with S sticky ends and dyed with red streptavidin, the other displays the complementary S' sticky ends and green streptavidin. Mixing those emulsions reveals specific adhesion between them due to the short-range S-S' hybridization. As expected this interaction is thermo-reversible: the red-green adhesive droplets dissociate upon heating and reassemble after cooling. Here the fluid phospholipids layer also leads to diffusive adhesion patches, which allows the bound droplets to rearrange throughout the packing structure. We quantify the adhesion strength between two droplets and build a theoretical framework that captures the observed trends through parameters such as the size of the droplets, the DNA surface density, the various DNA constructs or the temperature. This colloidal-scale, specific, thermo-reversible biomimetic emulsion offers a new versatile and powerful tool for the development of complex self-assembled materials.

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