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**Emulsion Droplets with DNA Origami Directed Patches: from Valence Control to Self-Assembly** YIN ZHANG[1], Department of Physics, New York University, XIAOJIN HE[2], REBECCA ZHUO, Center for Soft Matter Research, New York University, RUOJIE SHA, Department of Chemistry, New York University, JASNA BRUJIC, Department of Physics, New York University, NADRIAN SEEMAN, Department of Chemistry, New York University, PAUL CHAIKIN, Department of Physics, New York University — Recently DNA-directed emulsion architectures have been explored. Building highly ordered structures requires strict valence control of the DNA binders on the droplet's surface. Here, we demonstrate such control using cross-like DNA origami [1] as building units to form functional patches on emulsion droplets. Our DNA origami crosses have three functional parts: vertical sticky ends on the bottom layer for attaching to emulsion droplets; horizontal sticky ends for tile-tile 2D-assembly; and vertical sticky ends on the top layer for droplet-droplet assembly. On the emulsion droplets the DNA origami tiles self-assemble into one large patch directed by the hybridization of the horizontal sticky ends. Complimentary patches on different droplets then lead to dimer formation. Another set of origami is designed with different horizontal sticky ends, which forms a second patch on the droplet surface. By using complementary vertical sticky ends modified patches, the linear chaining of these divalent emulsion droplets is achieved. Our work demonstrates a novel and versatile approach for the development of complex self-assembled materials.

[1]These authors contribute equally to this work
[2]These authors contribute equally to this work

Yin Zhang
Department of Physics, New York University

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