Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Folding dynamics of linear emulsion polymers into 3D architectures[1] ANGUS MCMULLEN, DYLAN BARGTEIL, JASNA BRUJIC, NYU — Colloidal polymers have been limited to inflexible, solid colloids. Here we show that the fluidity of emulsion droplets allows for the self-assembly of flexible droplet chains, which can subsequently be folded into 3D structures via secondary interactions. We achieve this using DNA-guided interactions, to initially form the chain, and then program its folding pathways. When two emulsion droplets labeled with complementary DNA meet, the balance of hybridization energy and droplet deformation yields an equilibrium patch size. Therefore, the concentration of DNA on the surface determines the number of droplet-droplet bonds in the assembly. We find that 96% of bound droplets successfully self-assemble into chains. Droplet binding is a stochastic process, following a Poisson distribution of lengths. Since the fluid droplets can rearrange, we compare the dynamics of emulsion chains to that of polymers. We also trigger secondary interactions along the chain, causing the formation of specific loops or compact clusters. This approach will allow us to fold our emulsion polymers into a wide array of soft structures, giving us a powerful biomimetic colloidal system to investigate protein folding on the mesoscopic scale. This work was supported by the NSF MRSEC Program (DMR-0820341).

[1]This work was supported by the NSF MRSEC Program (DMR-0820341).

Angus McMullen
NYU

Date submitted: 11 Nov 2016 Electronic form version 1.4