Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Self-Assembly of Emulsion Droplets into Polymer Chains DYLAN BARGTEIL, ANGUS MCMULLEN, JASNA BRUJIC, New York Univ NYU — We experimentally investigate 'beads-on-a-string' models of polymers using the spontaneous assembly of emulsion droplets into linear chains. Droplets functionalized with surface-mobile DNA allow for programmable 'monomers' through which we can influence the three-dimensional structure of the assembled 'polymer'. Such model polymers can be used to study conformational changes of polypeptides and the principles governing protein folding. In our system, we find that droplets bind via complementary DNA strands that are recruited into adhesion patches. Recruitment is driven by the DNA hybridization energy, and is limited by the energy cost of surface deformation and the entropy loss of the mobile linkers, yielding adhesion patches of a characteristic size with a given number of linkers. By tuning the initial surface coverage of linkers, we control valency between the droplets to create linear or branched polymer chains. We additionally control the flexibility of the model polymers by varying the salt concentration and study their dynamics between extended and collapsed states. This system opens the possibility of programming stable three-dimensional structures, such as those found within folded proteins.

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Date submitted: 06 Nov 2015 Electronic form version 1.4