Collective Behavior of DNA made nanoparticles

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DNA oligomers can nowadays be assembled to produce a large variety of nanometric constructs, via a cascade of self-assembly processes, each one guided by the length of complementary sequences of distinct DNA strands. In the lecture I will show that it is possible to build bulk quantities of DNA-made nanoparticles that closely match idealized colloids, transferring modern in-paper and in-silico intuitions into experimental realizations. I will show how unconventional collective behaviors, recently explored theoretically and numerically, can indeed be reproduced in the lab. Specifically I will discuss: (i) how to exploit limited valence interactions to suppress phase separation[1,2], enhancing the stability of the equilibrium gel phase [3-5]; (ii) how to exploit competing interactions to generate a material that is fluid both at high and at low temperatures and a solid-like disordered open network structure in between [6-8] and (iii) how to exploit bond-swap dynamics to create an all-DNA vitrimer[9-10].

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