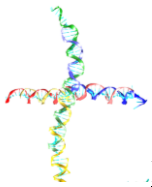
Playing with DNA hydrogels.



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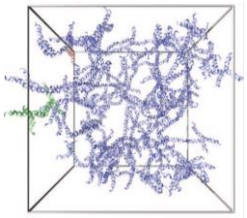

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DNA nanostars provide a versatile model system for investigating the physics of limited valence particles and the gel equilibrium state of matter[1]. The nanostars, assembled via a hierarchical self-assembly process[2], can interact with specific, tunable interactions encoded in the base sequence of the sticky ends. The availability of bulk quantities of nanoparticles made of DNA that closely match the designed structures allows us to transfer modern insights in paper and in silico into experimental realizations. I will first discuss how to exploit limited valence interactions to suppress phase separation[1,2] and form stable gel phases[3]. The resulting DNA hydrogels never crystallize and are characterized by the absence of aging and remarkable spatially uniform dynamics[4], in stark contrast to the concentration and dynamics heterogeneity exhibited by phase separation gels. I will also discuss how the adhesive sequence design can be used to select DNA-gel material properties, including how to exploit competing interactions to generate a reentrant gel[5], a material that is fluid at both high and low temperatures and a disordered open solid-like network structure in between, and how to exploit bond exchange dynamics to create an all-DNA vitrimer[6].

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