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Improving the compatibility of DNA-functionalized nanoparticles and DNA scaffolds in solutions of divalent cations[1] WILLIAM SHERMAN, MUDALIGE KUMARA, OLEG GANG, Center for Functional Nanomaterials, Brookhaven National Laboratory — With the construction of increasingly intricate nanometer scale assemblies from DNA, there is a push to use these structures as scaffolds for the precise arrangement of functional guests. Gold nanoparticles (AuNPs), with their size-tunable plasmon resonances, and convenient oxidation resistance have been the archetypical functional guests. Unfortunately, DNA nanostructures are generally only stable in a buffer with ∼10 mM concentration of divalent cations such as Mg^{+2}. These cations, however, induce the aggregation of DNA-functionalized AuNPs, which prevents their attachment to DNA scaffolds. Here we describe an approach in which AuNPs are covered by heterogeneous self-assembled monolayers consisting of thiolated DNA strands and thiolated zwitterions. These monolayers serve the dual function of allowing the AuNPs to attach to the DNA scaffolds via Watson-Crick base-pairing, while also allowing the AuNPs to resist aggregation for at least 7 weeks in buffer with 10 mM $MgCl_2$. This approach is thus more broadly applicable than previous methods for scaffolding particles on DNA constructs.

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