DNA-templated assembly of conductive inorganic nanostructures

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We use the method of scaffolded DNA origami to create designed nanostructures that can be modified site-selectively with inorganic semiconductors and metals. Our focus is on the bottom-up fabrication of architectures for integrated circuits. We have been improving the electrical conductivity of the metal nanostructures that we form on these DNA templates, as well as controlling the placement of semiconducting materials. We have studied conditions for improved seeding of nanoparticles on DNA nanostructures (Fig. 1), as a route to providing better conductivity in plated structures [1]. We are also evaluating the use of metal nanorods as plating seeds for high-aspect-ratio conductive nanowires (Fig. 2). We have recently fabricated tellurium nanorods and tested their attachment to DNA origami, as a route to precisely placing semiconductor materials. The extension to 3D DNA origami constructs is another application that has exciting implications for electronics, and we have been evaluating this possibility. These hybrid organic-inorganic DNA assemblies have a wide range of prospective uses in organizing nanoscale materials.

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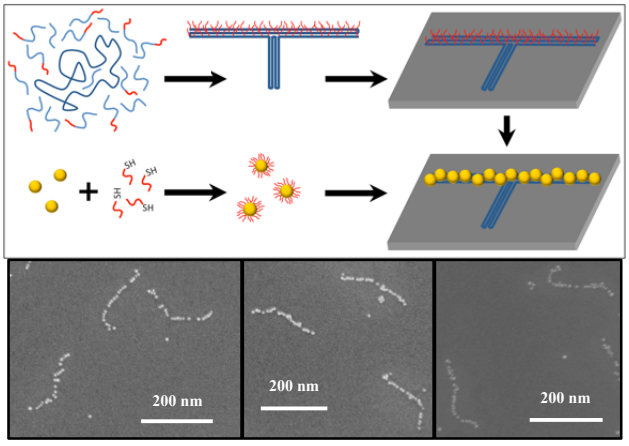

Fig. 1: Improved gold nanoparticle seeding on DNA origami. (top) Schematic of assembly and surface placement of seeded DNA origami. (bottom) SEM images of DNA origami with high seeding density.

*[1] E.P. Gates et al., RSC Advances **5**, 8134-8141 (2015).*

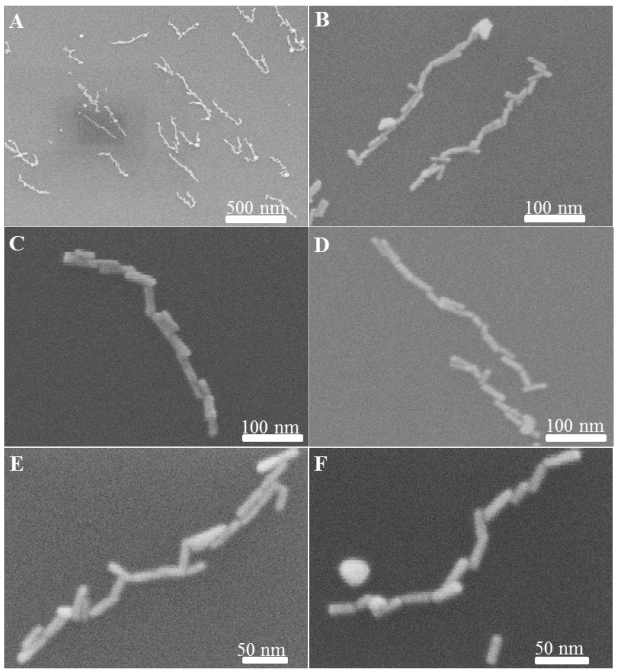

Fig 2: Linear DNA origami structures seeded with gold nanorods and then plated with gold to create continuous lines.