Isothermal DNA folding for origami based plasmonic nanostructures

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DNA origami technique is a powerful tool for the precise positioning of plasmonic nanostructures in the range of a few nanometers. DNA-nanoparticle structures are usually produced in two steps divided in the folding of the DNA origami and a subsequent conjugation with functionalized nanoparticles. A simultaneous assembly could not only increase the yield but also allows the realization of more complex plasmonic constructs, especially for a three dimensional shape. Such a one-pot solution demands an optimization of the folding protocols.

Our investigations of the DNA folding process without denaturing conditions are also discussed like a self-assembly of DNA origami even at room temperature. This would be also promising for a one-pot folding of DNA and thermo-sensitive biomolecules like enzymes.

For DNA-nanoparticle structures, we present a method where the nanoparticles are functionalized with staple strands directly involved in the folding process and therefore supported the one-pot self-assembly of DNA-nanoparticle structure.

The DNA surface can work as a nanobreadbord for spherical or anisotropic nanoparticles like silver nano-prisms. Latter ones are highly interesting because of their plasmonic properties but are challenging in their stability. Here the silver nano-prisms were covered with a very thin gold layer and conjugated with DNA to solve this problem.

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| Fig. 1 | Fig. 2 | Fig. 3 |

Fig. 1: Folding of DNA rectangles at constant temperature without a prior denaturation

Fig. 2: self-assembly of DNA-nanoparticles structures in a one-pot solution

Fig. 3: gold coated silver nano-prism and 5 nm gold nanoparticles

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*[1] P.W. Rothemund (2006). Nature, 440 (7082), 297–302.*

*[2] Ding et al.(2010). J Am Chem Soc, 132, 3248-3249*