CONTROLLING THE ORIENTATION OF CHIRAL DOUBLE-L DNA ORIGAMI ON DIFFERENT SUBSTRATES

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The ability to precisely control DNA origami orientation holds immense potential for a wide range of applications.[1] This includes the development of advanced metamaterials, highly sensitive chiral sensing platforms, high-density data storage devices, and sophisticated drug delivery systems. Any method to achieve DNA origami orientation control is therefore attractive for both fundamental research and technological innovation.

This presentation explains the simple yet powerful approach to control the orientation of DNA origami nanostructures upon deposition on different substrates. By varying the Mg^{2+} concentration of the buffer solution, we demonstrate the ability to control the orientation of a chiral 2D DNA origami shape on the mica surface (Figure 1). A chiral double-L (**CDL**) DNA origami structure was used that can adopt either an **S** or **Z** orientation upon adsorption. **CDL** adsorption on mica was probed by atomic force microscopy (AFM), both for dried samples as well as at the liquid-solid interface. Distributions of **S** and **Z** orientations are shown to depend dramatically on the Mg^{2+} concentration, ranging from randomly oriented **CDL**s to exclusive **S**. The results are explained by considering Mg^{2+} induced conformational transitions in the 3D shape of the 2D **CDL DNA** origami.

In the second part of the presentation, the influence of different substrates such as silica, graphite, and graphene on **S** or **Z** orientation will be discussed.

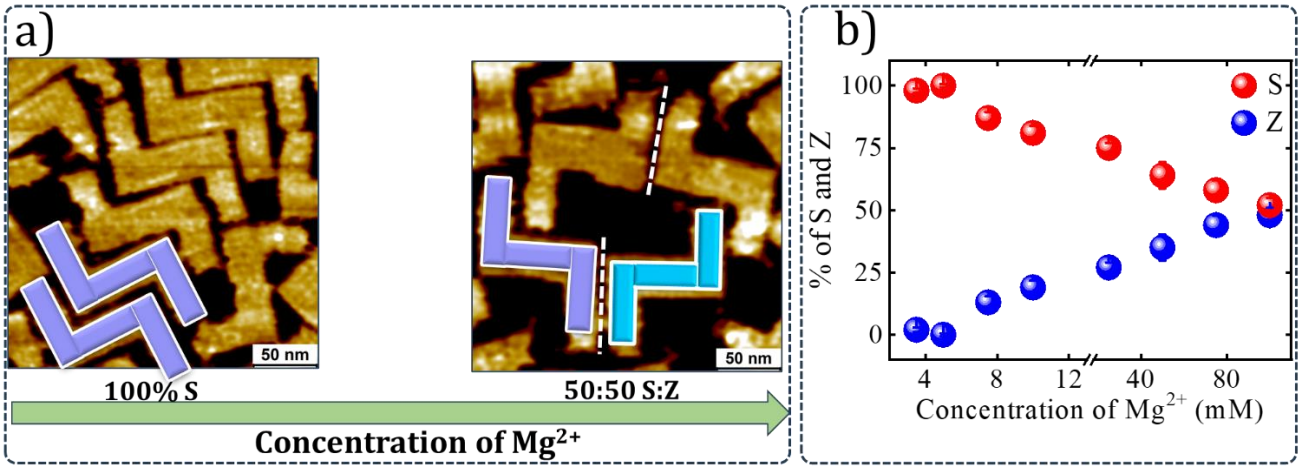

Figure1. (a) Schematic representations and high-resolution AFM images (scale bar is 50 nm) illustrate the mirror-image **S** and **Z** orientations of **CDL DNA** origami adsorbed on mica as a function of Mg^{2+} concentration. (b) % of **S** and **Z** orientations of the **CDL DNA** origami as a function of Mg^{2+} concentration at TAE buffer/mica interface.

References:

[1] Shen *et al*. Plasmonic nanostructures through DNA-assisted lithography. Sci. Adv. 2018, 4 (2), eaap8978.