DNA-Programmed Assembly of Molecules and Materials

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We are using DNA as a programmable tool for directing the self-assembly of molecules and materials. The unique specificity of DNA interactions and our ability to synthesize artificial functionalized DNA sequences makes it the ideal material for controlling self-assembly and chemical reactions of components attached to DNA sequences. Recently, we applied these methods to DNA templated conjugation of DNA to proteins such as antibodies.[1] In particular we are using DNA origami, large self-assembled DNA structures as a template for positioning of materials such as organic molecules, dendrimers and biomolecules.[2-4] We have also used DNA origami to image chemical reactions with single molecule resolution[4] and to make a 3D DNA origami box with a controllable lid.[5] The main focus of the presentation will be on a recently prepared conjugated DNA-phenylene vinylene polymer and its self-assembly on DNA origami for studies of electronic and optical properties (Fig 1).

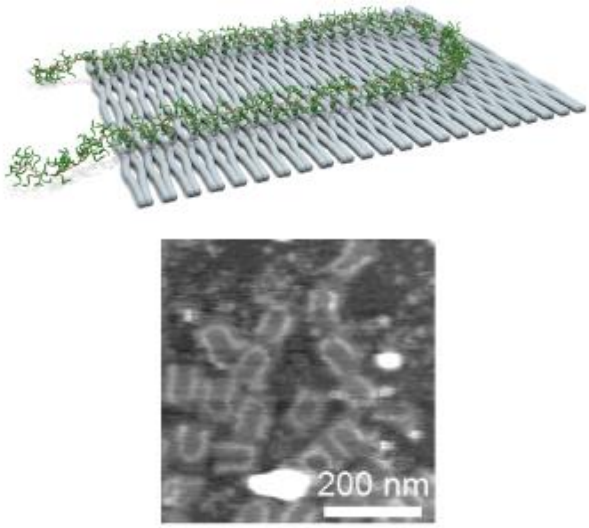

Figure 1. Illustration and AFM image of poly(DNA-phenylene vinylene) on DNA origami..

References

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[4] Voigt, N. V. et al. Nature Nanotech. 2010, 5, 200-205.
[5] Andersen, E. S. et al. Nature 2009, 459, 73-76.