FALL 2020 CHEMISTRY SEMINAR SERIES

DR. KURT VESTERAGER GOTHELF

Department of Chemistry and iNANO, Aarhus University, Denmark

HOST: DR. ZHANG

ALL THOSE INTERESTED ARE WELCOME TO ATTEND

"CHEMISTRY MEETS DNA NANOTECHNOLOGY"

October 2nd, 2020 ~ 11:30AM

Seminar Via Zoom

Abstract

DNA nanotechnology has emerged as a unique method to create self-assembled nanostructures of arbitrary structure. To make functional DNA nanostructures, integration of other molecules and materials is most often required and, with a few exceptions, this requires chemical functionalization of DNA strands. Fortunately, a variety of methods are available for the introduction of desired artificial functional groups into the DNA sequence.[1] During the past decade we have investigated methods for conjugation of a variety of organic molecules, polymers and biomolecules and their subsequent integration into nanostructures. Currently, we are developing some solid phase methods for functionalization of DNA strands. We have a long-standing interest in immobilization of single molecule conjugated polymers in DNA origami. For this purpose, we have prepared long phenylene-vinylene and fluorene polymers and synthesized DNA strands extending from most of the repeat units of the polymers.[2] The polymers self-assemble on tracks of complementary DNA strands extending from DNA origami structures and in this way the routing of the individual polymers can be controlled. By immobilizing fluorescent dyes along the polymer, we have investigated the properties of the polymers as single molecule optical wires (Figure 1).

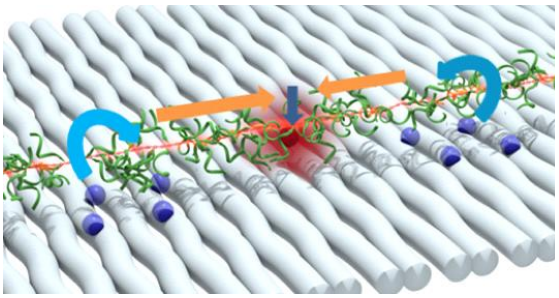

Figure 1: Transfer of excitation energy from a donor dye to an acceptor dye via a conjugated polymer immobilized on DNA origami.

In recent years we have furthermore developed methods for selective affinity-directed conjugation of small molecules and DNA to proteins such as antibodies.[3] The studies are now extended to the using the DNA for assembly of more proteins into advanced multifunctional structures and investigation of their potential as drugs. In one example a DNA-antibody conjugate was assembled to form a pseudo-IgM.[4]

1) M. Madsen, K. V. Gothelf *Chem. Rev.* **2019**, *119*, 6384-6458.
2) J. Knudsen *et al. Nature Nanotech.* **2015**, *10*, 892.
3) Rosen, C. B. et al. *Nature Chem.* **2014**, *6*, 804-809,
4) Nielsen, T. B. et al. *Angew. Chem.* **2019**, 58, 9068-9072.

Biographical Sketch: *Kurt Vesterager Gothelf* graduated from Aarhus University, Denmark in 1995, after PhD studies in organic chemistry under the supervision of Professor Karl Anker Jørgensen. In 1998, he moved to Duke University in the US as a postdoc in Professor M. C. Pirrung's group. From 2001 he advanced from assistant professor and associate professor to full professor in 2007 at Aarhus University. From 2007-2017, he was the head of the Center for DNA Nanotechnology funded by the Danish National Research Foundation. Currently he is in charge of the Novo Nordisk Foundation: Center for Multifunctional Biomolecular Drug Design.

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