



Structured 2D/3D material using DNA as building blocks

Introduction:

DNA nanotechnology aims at exploiting the physical chemical properties unique for DNA to create nanoscale objects and devices. The ability to create intermolecular, highly specific and programmable interactions is what makes the DNA molecule interesting from a nanotechnology point of view. These make it possible to, from single stranded molecules, synthesize double stranded helices and branched junctions. By creating overhangs or sticky ends these discrete structures can be combined in to ordered and larger structures. By adding predesigned short pieces of ssDNA together and using annealing temperature condition a two-dimensional structure is created. More recently structures made out of double crossover molecules and a DNA origami using dsDNA have made more robust 3D structures available. Further development have included the development of a computer program in order to, in silico, design the DNA assembly.

Tasks:

Literature study on self assembly of nucleotides and the use of DNA as building blocks.
Synthesis of ordered 2D crystals of DNA.
Synthesis and design of ordered 3D crystals of DNA using e.g. caDNAno.
Analysis of synthesized materials using SDS-PAGE, Transmission Electron Microscopy (TEM) and Atomic Force Microscopy (AFM) etc.

Knowledge: Knowledge that will be used (or obtained) in this project comprises general biochemistry, surface chemistry, DNA/genetics and characterization techniques such as TEM or AFM.

Reporting: The project will be finalized in a written report and an oral presentation at YKI.

Supervision: The supervision will be mainly performed by Christian Mille, PhD student at the Materials and Coating Section and Robert Corkery, Research director at YKI.

Literature: The student will actively keep up to date with the state-of-the-art technology regarding structured DNA and DNA programming. When starting the project he or she needs to read relevant literature on the subject.

Requirements: University level education in chemistry, chemical engineering, biotechnology or other relevant subject.

Starting date: August 2010 or potentially earlier if the student wish to combine the project with a summer internship.

Duration: 20-40 weeks (30-60 hp)

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