Electronic Supplementary Material (ESI) for Chemical Communications
This journal is © The Royal Society of Chemistry 2012

Supplementary Material (ESI) for Chemical Communications
This journal is (c) The Royal Society of Chemistry 2010

DNA Cohesion through Bubble-Bubble Recognition

Hang Qian,[a,b] Jinwen Yu,[b] Pengfei Wang,[b] Quan-Feng Dong*[a] & Chengde Mao*[b]

[a] State Key Laboratory for Physical Chemistry of Solid Surfaces and Department of Chemistry, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen, Fujian 361005, China; [b] Department of Chemistry, Purdue University, West Lafayette, Indiana 47907, USA.

Supplementary Information

Materials and Methods

Oligonucleotides. DNA sequences were adapted from previous works, which were originally designed by a computer program "SEQUIN" (Seeman, N. C. *J. Biomol. Struct. Dyn.* **1990**, *8*, 573-581). All oligonucleotides were purchased from IDT, Inc. and purified by 15-20% denaturing polyacrylamide gel electrophoresis (PAGE).

Formation of DNA complexes. All DNA strands were combined together in one-pot in Tris-Acetic-EDTA-Mg^{2+} (TAE/Mg^{2+}) buffer and annealed: 95 ˚C/5 min., 65 ˚C/30 min., 50˚C /30 min, 37˚C /30 min., 22 ˚C/30 min and 4 ˚C/30min. TAE/Mg^{2+} buffer contained 40 mM Tris base (pH 8.0), 20 mM acetic acid, 2 mM EDTA and 12.5 mM magnesium acetate. Magnesium acetate was used to adjust the Mg^{2+} concentration. DNA concentrations: 1.0 μM for thermal denaturing study (to make sure that the DNA concentration was in the range of accurate UV-Vis measurement), 3.4 μM for native PAGE (to make sure enough DNA in each band for visualization), and 1.0 μM for AFM imaging (and diluted by 10 times immediately before being deposited onto mica surface for proper DNA coverage on the substrate).

Native PAGE. Gels contained 6% polyacrylamide (19:1 acrylamide/bisacrylamide) and were run on a FB-VE10-1 electrophoresis unit (FisherBiotech) at 4 °C (80 V, constant voltage). The running buffer was the same as the buffer for DNA samples (TAE/Mg^{2+} buffer with adjusted Mg^{2+} concentration). After electrophoresis, the gels were stained with Stains-All (Sigma) and scanned with a common HP office scanner.

Thermal denaturation study. 3 mL DNA complexes in TAE/Mg^{2+} buffer was transferred into a quartz cuvette. Optical absorbance was monitored at 260 nm by a CARY 100 Bio UV/Visible spectrophotometer while the solution temperature increased at a rate of 0.5 ºC/min from 5 ºC to 90 ºC. TAE/Mg^{2+} buffer without DNA was used as a blank.

AFM imaging. A drop of 1.5 μl DNA solution was deposited onto freshly cleaved mica (Ted Pella, Inc.) and left to adsorb to the surface for 3 min. 20 μL TAE/Mg^{2+} buffer was then added to the mica surface. Imaging was performed in a fluid cell in tapping mode on a Multimode NanoScope IIIa (Digital Instruments) with NP-S oxide-sharpened silicon nitride probes (Veeco Probes .). The tip velocity was kept at 10 μm/s, otherwise a scan frequency of 1 Hz or lower was used. The tip-surface interaction was minimized by optimizing the scan set-point. AFM imaging was performed at 25 °C.