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A Nanomotor Involves a Metastable, Left-Handed DNA Duplex

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Supporting Information

Material and Methods

DNA oligonucleotides:

F:5'-FAM-TGCATACCATCTAACCTCCAGACCTTACGCTC-TAMRA-3';
L: 5'-GGTTAGATGGTATGCTCACCCACCTGAGCCACTACGACAATGAGCGTAAGGTCTGG-3';
O: 5'-TTTTTTGGGTGCTCAGGTAGTGGTTGTCGTTTTT-3';
R: 5'-CGACAACCACTACCTGAGCAC CCA-3'.
All oligonucleotides were purchased from Integrated DNA Technologies, Inc. and purified by denaturing polyacrylamide gel electrophoresis.

Nanomotor formation and motion: DNA strands (1.0 μM) were combined at equal molar ratio in TAE/Mg^{2+} buffer, composed of tris(hydroxymethyl)aminomethane (Tris) base (40 mM, pH 8.0), acetic acid (20 mM), ethylenediaminetetraacetate (EDTA; 2 mM), and $MgAc_2$ (12.5 mM). The nanomotor was formed by incubating the DNA solution as follows: 95 ºC (5 min), 65 ºC (30 min), 50 ºC (30 min), 37 ºC (30 min), 23 ºC (30 min). During motion cycling, strand **O** and strand **R** were alternatively added into the DNA solution and incubated for 30 minutes and then analyzed by gel electrophoresis and FRET experiment.

Nondenaturing polyacrylamide gel electrophoresis (PAGE): Gels contained 8% polyacrylamide (acrylamide/bisacrylamide, 19:1). The separation buffer (TAE/Mg^{2+}) was the same as the buffer for DNA nanomotor formation. Gels were run on a Hoefer SE 600 electrophoresis unit at 23 ºC (250 V, constant voltage). After electrophoresis, the gels were stained with Stains-all dye (Sigma) and scanned.

Fluorescence spectroscopy: Fluorescence emission spectra were recorded on a Fluorolog® spectrophotometer. All spectra were collected at 23 ºC. The samples were excited at 470 nm and the emission data were collected between 500 and 750 nm. The maximal emission wavelengths of FAM and TAMRA were 516 nm and 576 nm respectively.