Supporting information

Experimental

Material

Nuclease S1 was purchased from Takara Bio Inc. (Shiga, Japan). 5′-fluorescein-labeled-d(CCCTAA)$_3$CCCT from Sagon (Shanghai, China). Single-walled carbon nanotubes (SWNTs, Φ = 1.1 nm, purity >90%) was purchased from Aldrich, and purified as described previously.[1]

S1 nuclease digestion and PAGE experiments

Digestion was performed at pH 5.5. Reaction mixtures contained S1 buffer and 6 units of S1 nuclease.[2] 5′-fluorescein-labeled oligomer (i-motif DNA) (1.1 μg) alone and **the i-motif DNA/SWNTs complex were incubated overnight at 4℃ in buffer** before initiating digestion at 37℃ in 30 mM sodium acetate (pH 4.6), 280 mM NaCl, 1 mM $ZnSO_4$, and 6 units of S1 nuclease. Digestions were stopped by adding 4 μL of stop buffer (70% formamide and 57 mM EDTA at pH 7.5) after 5 min, and then freezing. Frozen samples were added 1μL formamide and heated at 95℃ for 1 min prior to loading on a 20% polyacrylamide gel by electrophoresis (70 min in 1×TBE running buffer) at room temperature and 20 V/cm using an Bio-Rad instrument. The samples which contain SWNTs should centrifuge in order to remove the excess SWNTs.

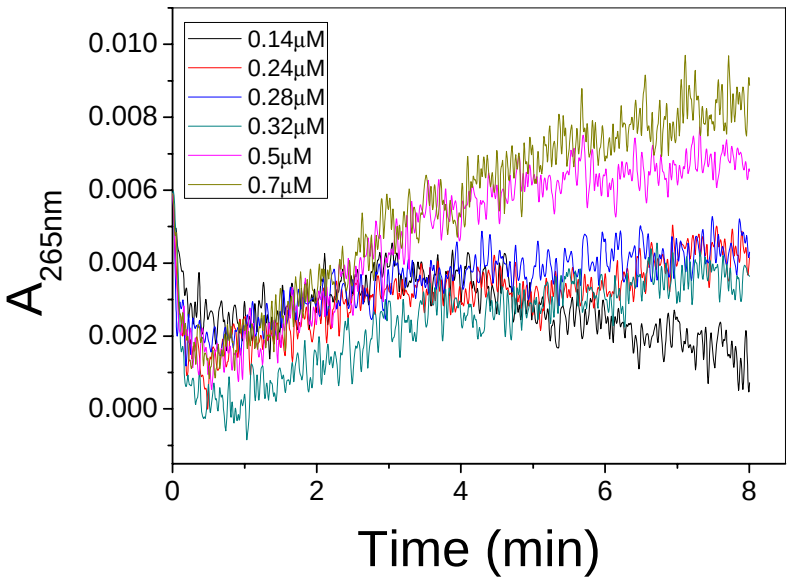
HPLC analysis

i-motif DNA was digestion by S1 and the reaction was stopped by NaOH (pH 12) and formamide which has the same effect on the digestion, because the EDTA may have interaction with ZORBAX Oligo column. The strong alkaline pH and formamide served to stop the enzymatic reaction and to denature the DNA. The products of digestion were heated at 90℃ for 5 min and immediately cooled in an ice-water bath. This procedure ensured to completely denature the samples. The denatured DNA fragments were separated by HPLC according to their size on a ZORBAX Oligo column (Agilent), using a gradient of NaCl from 0 to 0.8 M in 90 min, and were detected and quantified through its absorbance at 260 nm, by using an integrator recorder (Beckman, 168 detector).

Enzyme kinetics of S1 nuclease

Kinetics were performed in Cary 300 spectrophotometer by enzyme kinetics program, the kinetic curve was obtained by measuring the absorbance at 265nm as a function of time after adding i-motif DNA or i-motif DNA/SWNTs to 1 cm path-length quartz cuvettes.[2,3] The reaction was carried out in 30 mM sodium acetate (pH 4.6), 280 mM NaCl, and 1 mM $ZnSO_4$ at 20 ℃. The total volume is 200 μL. Fixed S1 nuclease concentration is 10 U, changing the substrate concentration, a series of initial reaction velocity were measured from the time courses. Plotting $1/V_0$ versus 1/[S] (V_0 and [S] represent the initial velocity and substrate concentration, respectively) yields a straight line (the Lineweaver-Burk plot: $1/V_0=1/V_{max}+K_m/V_{max}*1/[S]$), several

important kinetic parameters like V_{max} (maximum initial velocity), K_m (Michaelis-Menten constant), k_{cat} (turnover number) can be determined.



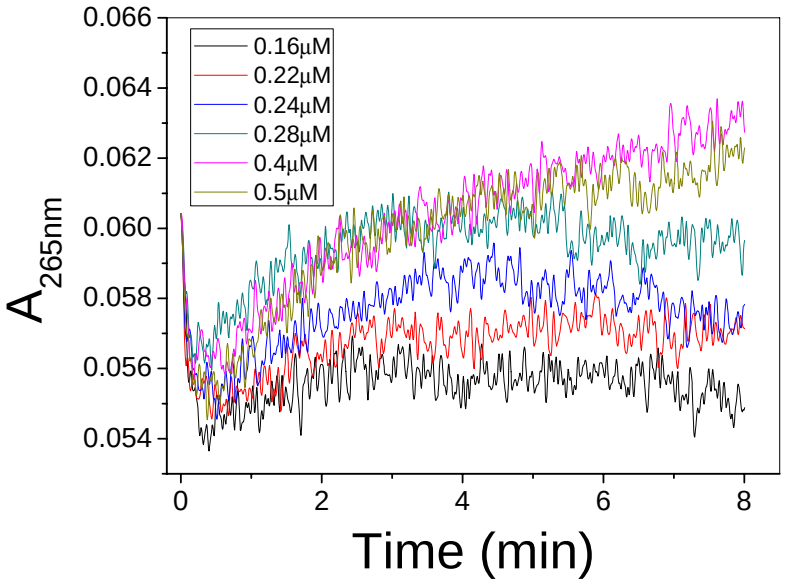


Figure S1: Time curves of the cleavage of i-motif DNA by S1 nuclease at different i-motif concentration in the absence and presence of SWNTs. Select the time range from 0.5 to 2.5 min to fit linear.

References

1. X. Li, Y. Peng and X. Qu, *Nucleic Acids Res.*, 2006, **34**, 3670.

2. X. Li, Y. Peng, J. Ren and X. Qu, *Proc. Natl. Acad. Sci. U S A*, 2006, **103**, 19658.

3. J. Ren, X. Qu, N. Dattagupta, J. B. Chaires, *J. Am. Chem. Soc.*, 2001, **123**, 6742.