

DNA Cleavage by the Cu(II) Complex of the DNA-intercalating 9-Bis(pyridin-2-ylmethyl)aminobenzo[*b*]quinolizinium

Maoqun Tian, Heiko Ihmels* and Elke Brötz

University of Siegen, Organic Chemistry II, Adolf-Reichwein-Str. 2, D-57068 Siegen,
Germany. E-mail: ihmels@chemie.uni-siegen.de; Tel: +49 (0) 271 740 3440

Supporting Information

¹ H-, ¹³ C-, and 2D-NMR spectra of 1a	S2-S4
Job's plot of 1a with Cu ²⁺	S4
DNA cleavage experiments	S5
Photometric and fluorimetric pH titrations of 1a	S6
Photometric titrations of 1a with polynucleotides	S7
Viscometric titrations of ct DNA with 1a	S8

13C NMR spectrum of compound 1 in CDCl₃. The x-axis represents chemical shift in PPM, ranging from 0 to 160. The spectrum shows several sharp peaks. A large peak is at 0 ppm (TMS). Other significant peaks are at 157.5070, 154.3353, 150.4720, 139.2466, 138.817, 138.6310, 138.5175, 134.0397, 130.6077, 130.5945, 126.6788, 124.8960, 123.8960, 122.7489, 121.5964, 119.6448, 102.3825, 57.8620, and 49.8996 ppm. An arrow points to a small peak at approximately 49 ppm, labeled 'MeOH'.

S2

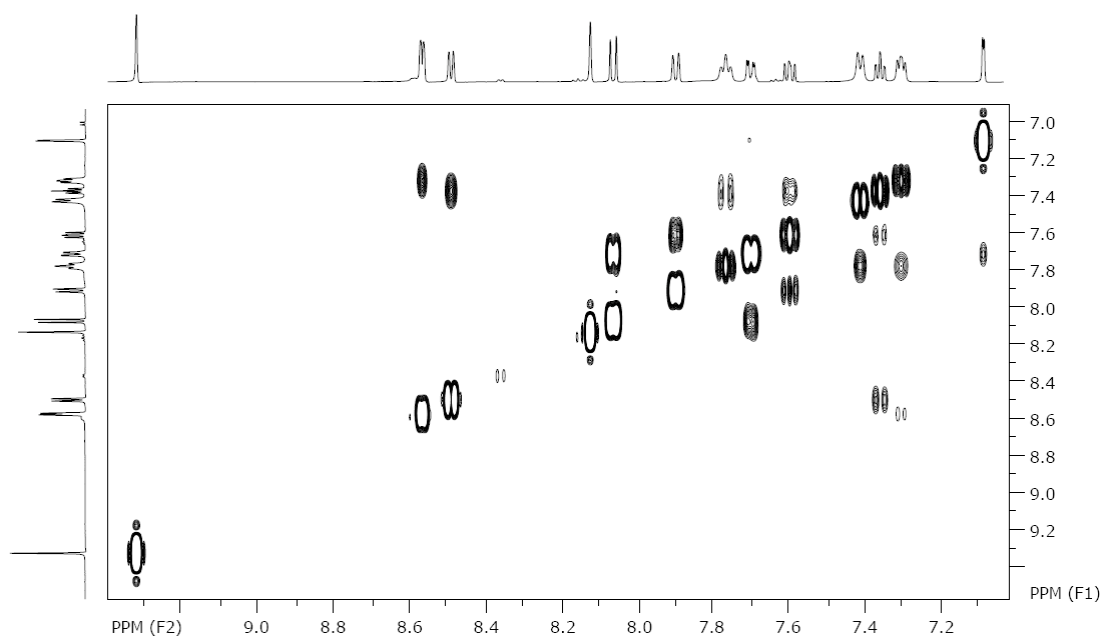


Figure S3. { ^1H , ^1H }-COSY spectrum of **1a** in CD_3CN .

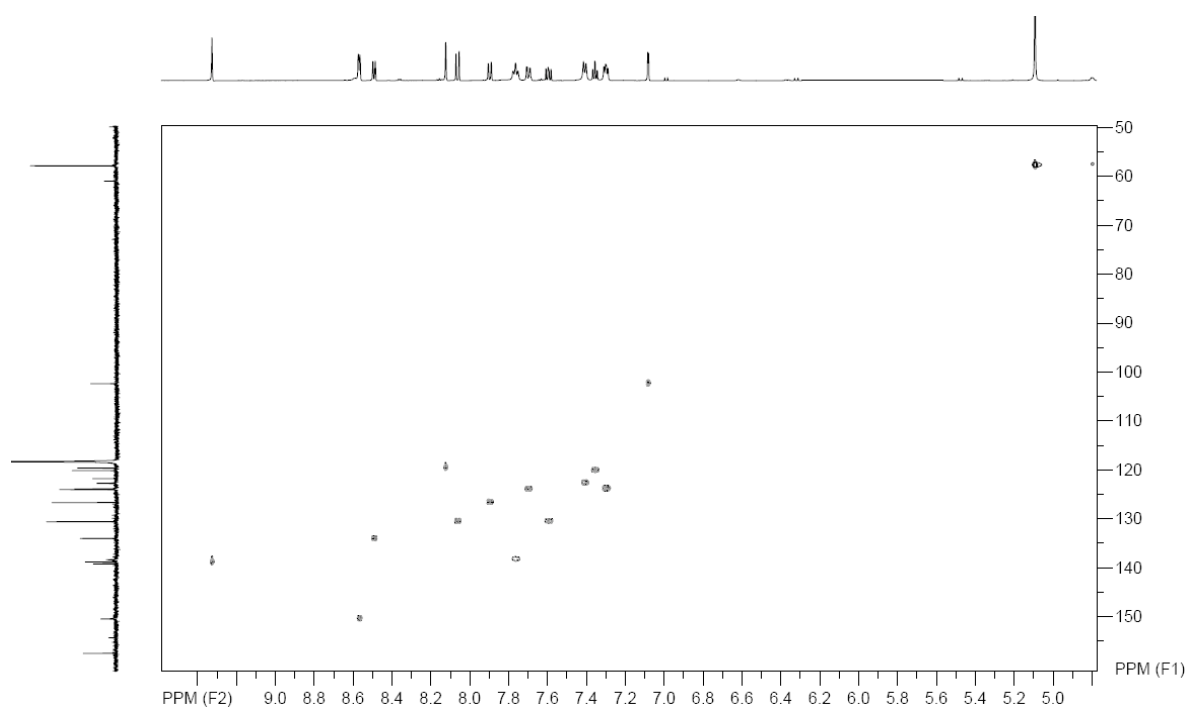


Figure S4. HSQC spectrum of **1a** in CD_3CN

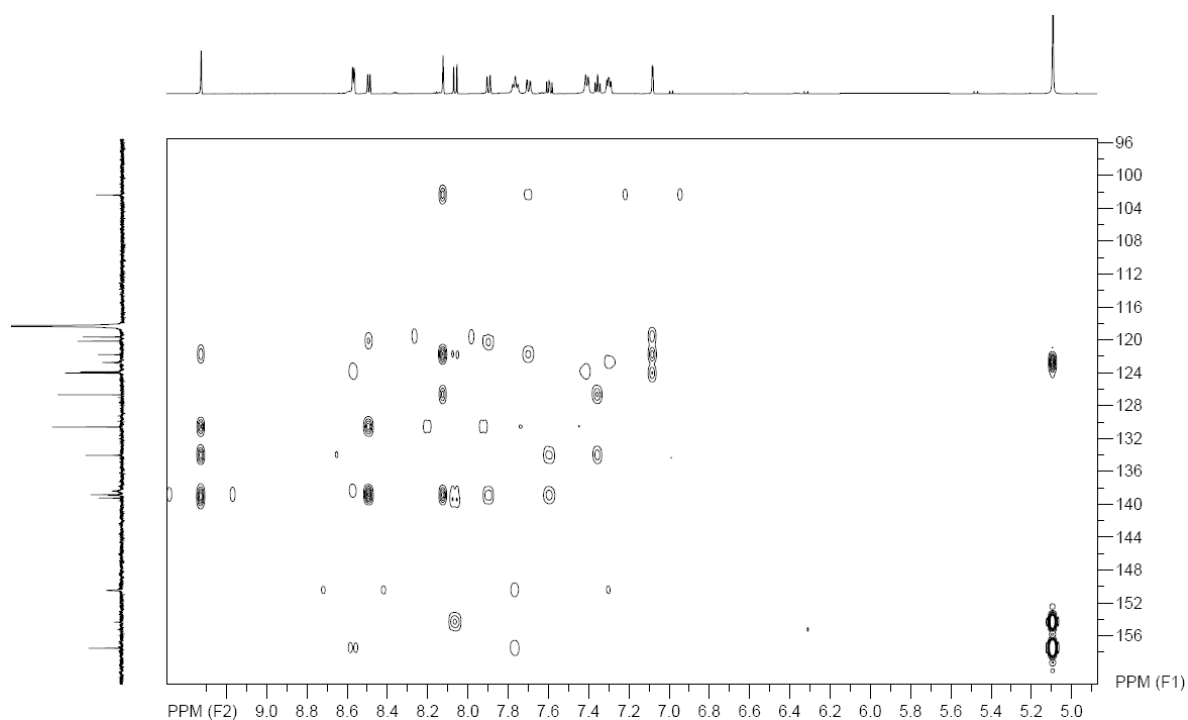


Figure S5. HMBC spectrum of **1a** in CD₃CN.

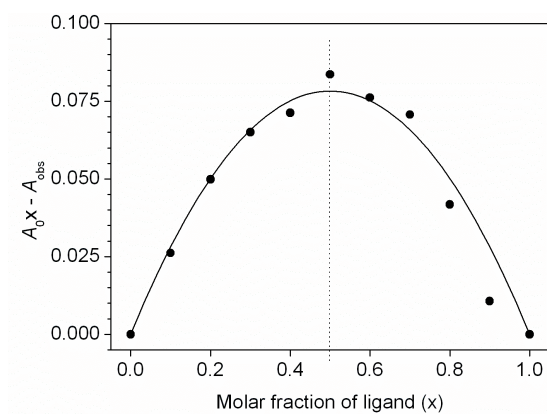


Figure S6. Job' plot of **1a** with Cu²⁺ in water (HEPES, 50 mM, pH 7.30). The total concentration of **1a** and Cu²⁺ is 50 μ M. The absorption was measured at $\lambda = 440$ nm.

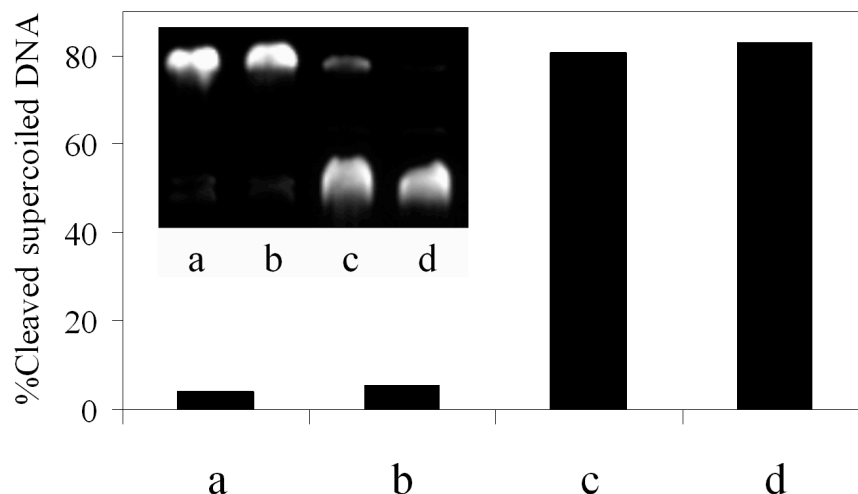


Figure S7. Formation of single-strand breaks in plasmid pBR322 (0.03 mM in bp) in the absence of **1a**-Cu(II) complex under aerobic (a) and anaerobic (b) conditions, and in the presence of **1a**-Cu²⁺ complex (0.04 mM) under aerobic (c) and anaerobic (d) conditions. $T = 37\text{ }^{\circ}\text{C}$, $t = 2\text{ h}$, pH = 7.3 buffer (50 mM Tris-HCl/10 mM NaCl).

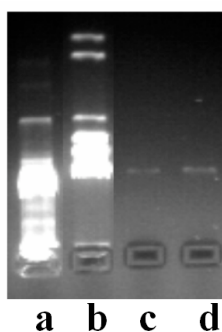


Figure S8. T4 ligase enzymatic assay: a: Religated Lambda DNA/HindIII after incubation with T4 ligase; b: Lambda DNA/HindIII after incubation without T4 ligase; c: relaxed plasmid pBR322 after treatment with the **1a**-Cu(II) complex; d: plasmid pBR322 after treatment with the **1a**-Cu(II) complex and subsequent incubation with T4 ligase.

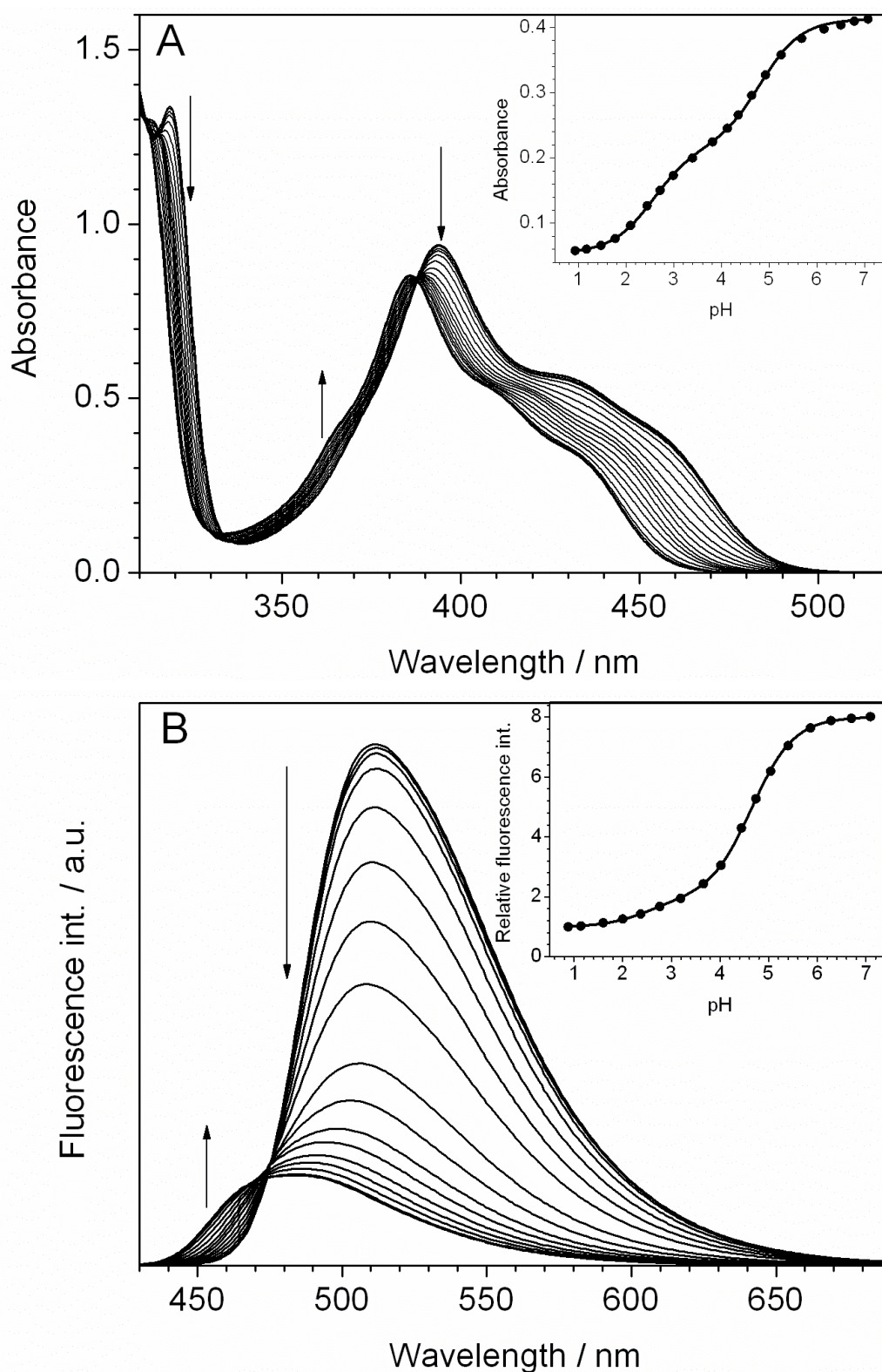


Figure S9. Spectrophotometric (A) and spectrofluorimetric titration (B) of aq. HCl (2 M) to **1a** (A: $c = 50 \mu\text{M}$; B: $c = 10 \mu\text{M}$) in Britton-Robinson buffer (pH = 0.9–7.1). The arrows indicate the changes of the bands upon acidification. Insets: Plot of the absorption at 454 nm (A) and emission intensity at 512 nm (B) versus pH of the solution, numerical fits calculated for $pK_a = 2.5 \pm 0.1$ and 4.7 ± 0.2 from photometric titration.

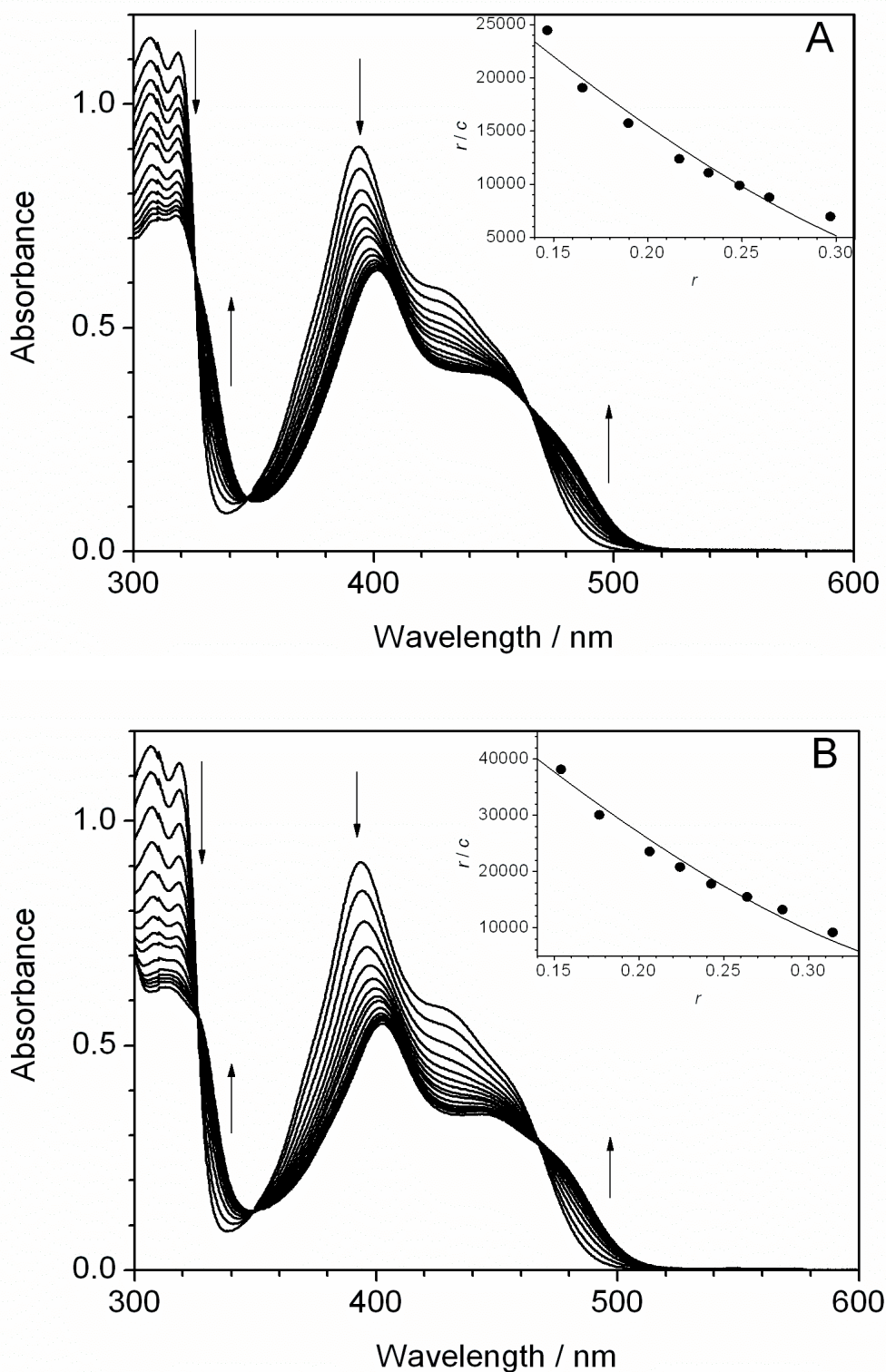


Figure S10. Spectrophotometric titration of poly(dAdT)₂ (A) and poly(dCdG)₂ (B) to **1a** ($c = 50 \mu\text{M}$) in BPE buffer; pH = 7.0. The arrows indicate the changes of the bands upon addition of polynucleotides DNA. Insets: the Scatchard plot (r/c vs c ; r = ligand-to-DNA ratio r) fitted to the neighbor-exclusion model of McGhee and von Hippel to give the binding constants $K_b = (1.5 \pm 0.1) \times 10^4 \text{ M}^{-1}$ (A) and $K_b = 3.1 \pm 0.1 \times 10^4 \text{ M}^{-1}$ (B), binding site sizes $n = 2.0 \pm 0.1$ (A) and $n = 2.3 \pm 0.1$ (B).

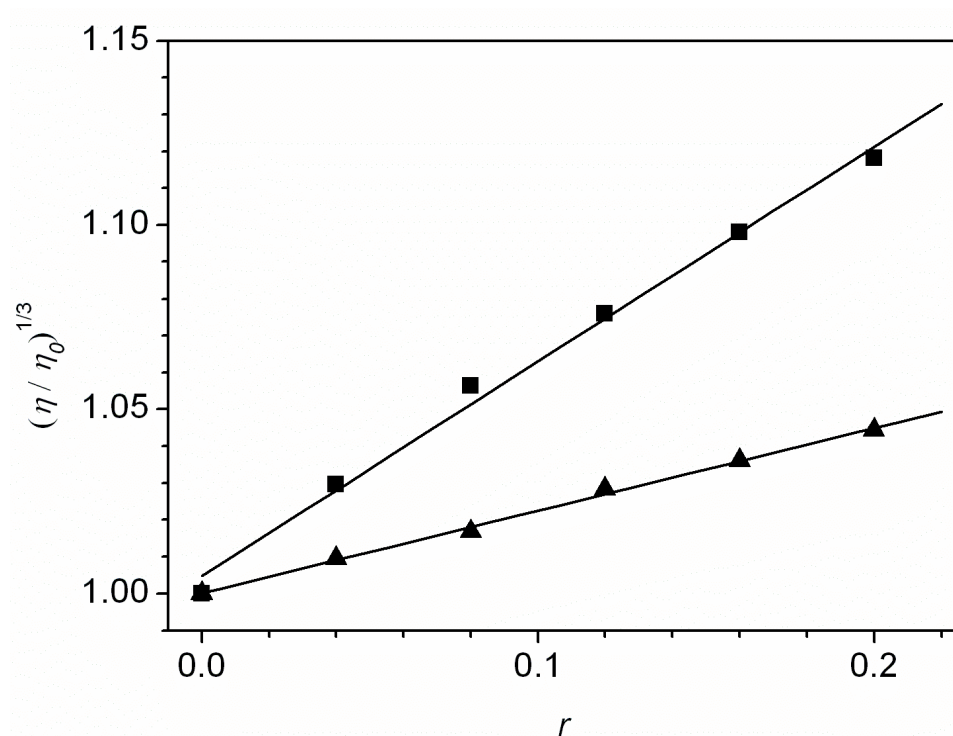


Figure S11. The relative specific viscosity of ct DNA solutions in the presence of ethidium bromide (■) and **1a** (▲) versus ligand-to-DNA ratio r .