

## Supporting Information

### Y-type C-rich DNA Probe for Electrochemical Detection of Silver Ion and Cysteine

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#### Supplementary results and discussion

TableS1. Equivalent circuit element values for  $\text{Ag}^+$ -DNA films in absence and presence of Cys

	equivalent circuit elements						$\frac{\text{Rct}_{[\text{Ag}^+]} - \text{Rct}_{[\text{Cys}]}}{\text{Rct}_{[\text{Ag}^+]} - \text{Rct}}$
	$R_s$ ( $\text{k}\Omega$ )	$C_{\text{film}}$ ( $\mu\text{F}$ )	$R_{\text{CT}}$ ( $\text{k}\Omega$ )	$R_x$ ( $\text{k}\Omega$ )	CPE ( $\mu\text{F}$ )	$n$	
DNA	0.6(0.01)	0.09(0.01)	193(2)	0.44(0.03)	0.20(0.02)	0.9(0.01)	—
$\text{Ag}^+(10^{-5} \text{ M})$	0.6(0.02)	0.08(0.01)	447(36)	0.29(0.01)	0.16(0.01)	0.9(0.03)	—
Cys ( $10^{-5} \text{ M}$ )	0.7(0.01)	0.04(0.02)	197(9)	0.33(0.01)	0.18(0.01)	0.9(0.02)	0.98(0.091)
Cys ( $10^{-7} \text{ M}$ )	0.7(0.02)	0.04(0.02)	297(15)	0.67(0.02)	0.28(0.02)	0.9(0.05)	0.59(0.095)
Cys ( $10^{-9} \text{ M}$ )	0.7(0.01)	0.05(0.02)	337(11)	0.36(0.02)	0.19(0.01)	0.9(0.01)	0.43(0.091)
Cys ( $10^{-11} \text{ M}$ )	0.6(0.02)	0.05(0.02)	388(20)	0.34(0.01)	0.09(0.01)	0.9(0.02)	0.23(0.047)
Cys ( $10^{-12} \text{ M}$ )	0.7(0.02)	0.07(0.02)	398(18)	0.54(0.02)	0.15(0.01)	0.9(0.01)	0.19(0.052)
Cys ( $10^{-13} \text{ M}$ )	0.6(0.01)	0.04(0.01)	415(16)	0.38(0.01)	0.14(0.02)	0.9(0.02)	0.13(0.044)
Cys ( $10^{-14} \text{ M}$ )	0.6(0.02)	0.05(0.02)	436(22)	0.29(0.01)	0.13(0.02)	0.9(0.02)	0.04(0.032)

The values in parentheses represent the standard deviations from at least 5 electrode measurements.

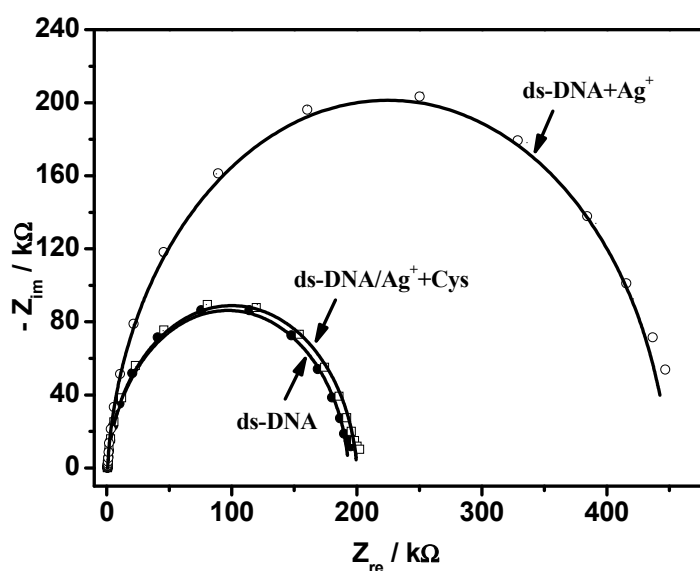


Figure S1. Representative Nyquist plots ( $-Z_{\text{im}}$  vs  $Z_{\text{re}}$ ) for films of dsDNA before ( $\bullet$ ) and after incubating with  $10^{-5} \text{ M Ag}^+$  ( $\circ$ ) and subsequently  $10^{-5} \text{ M Cys}$  ( $\square$ ) in buffer solution (20 mM Tris- $\text{ClO}_4$ , pH=7.0). Measured data are shown as symbols with calculated fit to the equivalent circuit as solid lines.

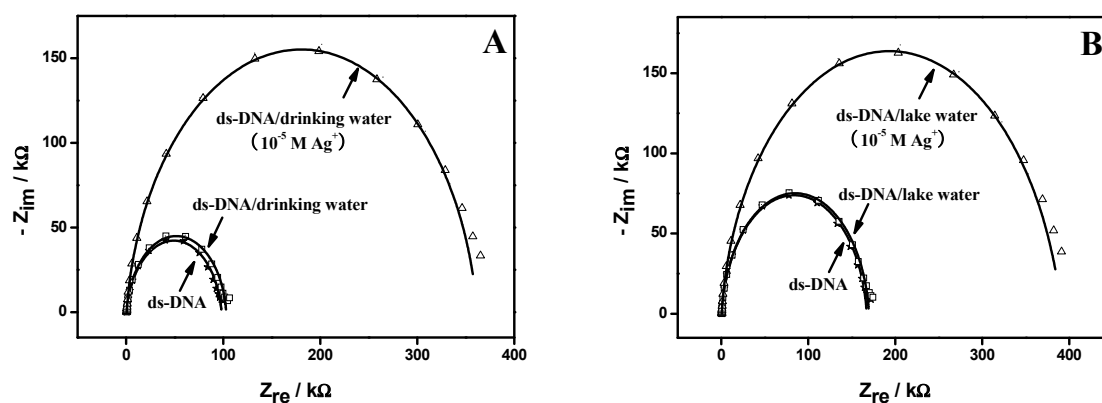


Figure S2. Applications in real water samples: (A) drinking water. (B) lake water. Both representative Nyquist plots ( $-Z_{im}$  vs  $Z_{re}$ ) for films of ds-DNA before ( $\star$ ) and after incubating in water sample ( $\square$ ) and subsequently in water sample with  $10^{-5}$  M  $Ag^+$  ( $\triangle$ ). Measured data are shown as symbols with calculated fit to the equivalent circuit as solid line.

TableS2. Equivalent circuit element values for DNA films in drinking water in absence and presence of  $Ag^+$  and Cys

	equivalent circuit elements						
	$R_s$ (k $\Omega$ )	$C_{film}$ ( $\mu$ F)	$R_{CT}$ (k $\Omega$ )	$R_x$ (k $\Omega$ )	CPE ( $\mu$ F)	n	$\Delta R_{CT}$ (k $\Omega$ )
Drinking water	0.6(0.01)	0.06(0.01)	98(5)	0.36(0.01)	0.19(0.01)	0.9(0.01)	—
$Ag^+$ ( $10^{-5}$ M)	0.6(0.01)	0.08(0.01)	361(10)	0.33(0.01)	0.20(0.01)	0.9(0.02)	263(11)
$Ag^+$ ( $10^{-7}$ M)	0.6(0.01)	0.07(0.01)	216(13)	0.32(0.02)	0.18(0.02)	0.9(0.01)	118(9)
$Ag^+$ ( $10^{-10}$ M)	0.6(0.01)	0.07(0.01)	139(12)	0.34(0.02)	0.15(0.01)	0.9(0.01)	41(4)
$Ag^+$ ( $10^{-13}$ M)	0.7(0.01)	0.06(0.01)	118(10)	0.32(0.01)	0.16(0.01)	0.9(0.01)	20(2)
$Ag^+$ ( $10^{-14}$ M)	0.6(0.01)	0.06(0.01)	103(7)	0.34(0.01)	0.17(0.01)	0.9(0.01)	5(3)
Cys( $10^{-5}$ M)	0.7(0.01)	0.09(0.02)	99(6)	0.39(0.02)	0.16(0.01)	0.9(0.01)	1(1)

The values in parentheses represent the standard deviations from at least 5 electrode measurements.

TableS3. Equivalent circuit element values for DNA films in lake water in absence and presence of Ag<sup>+</sup> and Cys

	equivalent circuit elements						
	$R_s$ (k $\Omega$ )	$C_{\text{film}}$ ( $\mu\text{F}$ )	$R_{\text{CT}}$ (k $\Omega$ )	$R_x$ (k $\Omega$ )	CPE ( $\mu\text{F}$ )	$n$	$\Delta R_{\text{CT}}$ (k $\Omega$ )
Lake water	0.7(0.01)	0.06(0.01)	167(8)	0.29(0.01)	0.12(0.01)	0.9(0.01)	—
Ag <sup>+</sup> (10 <sup>-5</sup> M)	0.7(0.03)	0.12(0.02)	391(13)	0.98(0.04)	0.17(0.02)	0.8(0.01)	224(12)
Ag <sup>+</sup> (10 <sup>-7</sup> M)	0.6(0.03)	0.08(0.01)	289(12)	0.38(0.02)	0.12(0.01)	0.9(0.01)	122(9)
Ag <sup>+</sup> (10 <sup>-10</sup> M)	0.7(0.02)	0.06(0.01)	213(14)	0.31(0.01)	0.11(0.01)	0.9(0.01)	46(4)
Ag <sup>+</sup> (10 <sup>-13</sup> M)	0.7(0.04)	0.06(0.01)	177(11)	0.34(0.01)	0.11(0.01)	0.9(0.02)	10(1)
Ag <sup>+</sup> (10 <sup>-14</sup> M)	0.7(0.04)	0.06(0.01)	169(11)	0.29(0.01)	0.12(0.01)	0.9(0.01)	2(1)
Cys(10 <sup>-5</sup> M)	0.6(0.02)	0.09(0.02)	171(10)	0.31(0.01)	0.15(0.02)	0.9(0.01)	4(1)

The values in parentheses represent the standard deviations from at least 5 electrode measurements.