

Electronic Supplementary Information

(ESI)

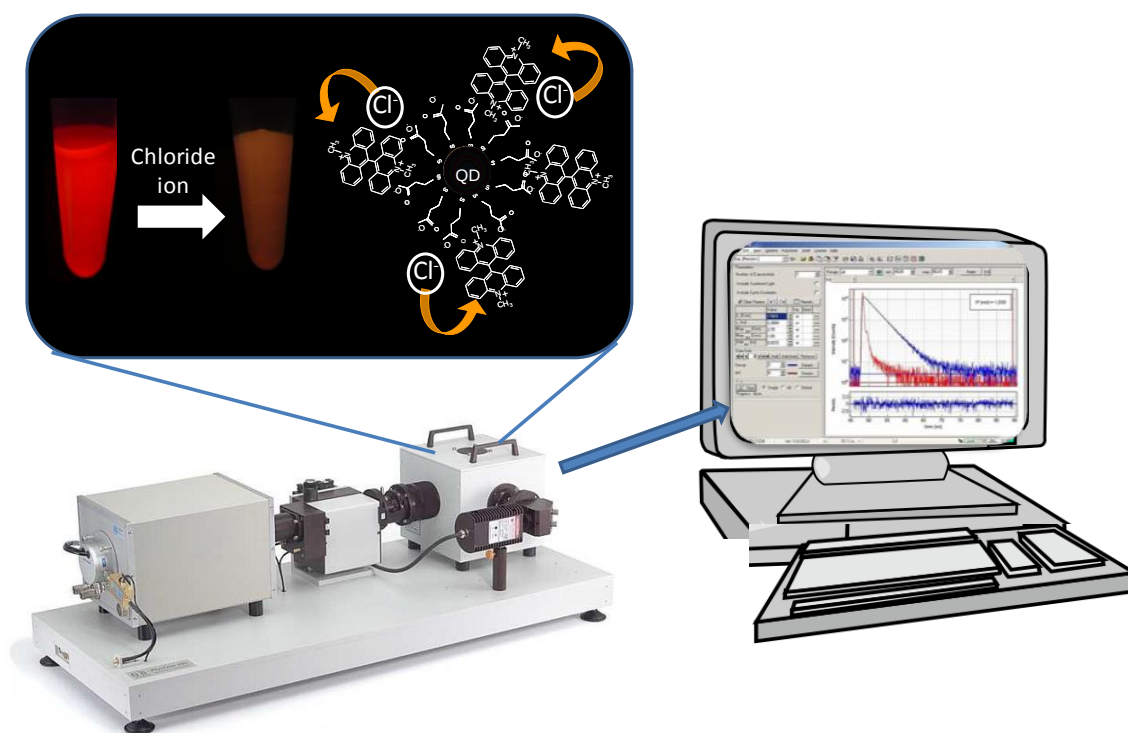
A Chloride ion nanosensor for time-resolved fluorimetry and Fluorescence Lifetime Imaging

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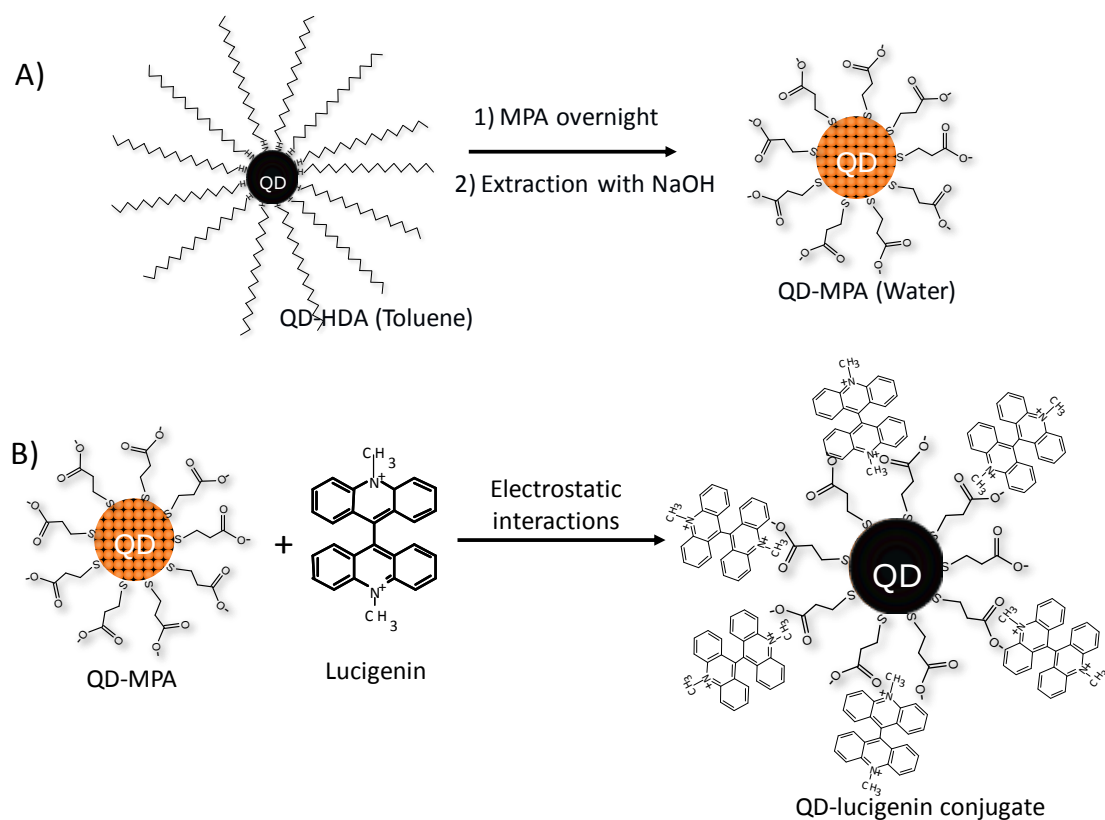
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Supplementary Schemes S.1 and S.2	p. S2-S3
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Scheme S.1. Analytical setup for the measurement of the photoluminescence decays of QD-luciferin conjugates.



Scheme S.2. A) Synthesis of the water soluble QD-MPA. B) Synthesis of the QD-lucigenin conjugates.

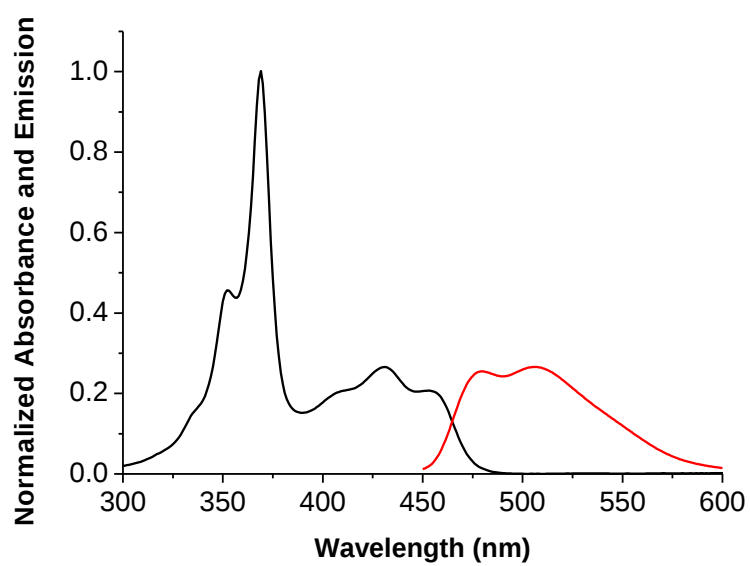


Figure S.1. Normalized absorption (black) and emission (red) spectra ($\lambda_{\text{ex}} = 440$ nm) of lucigenin in milli-Q water.

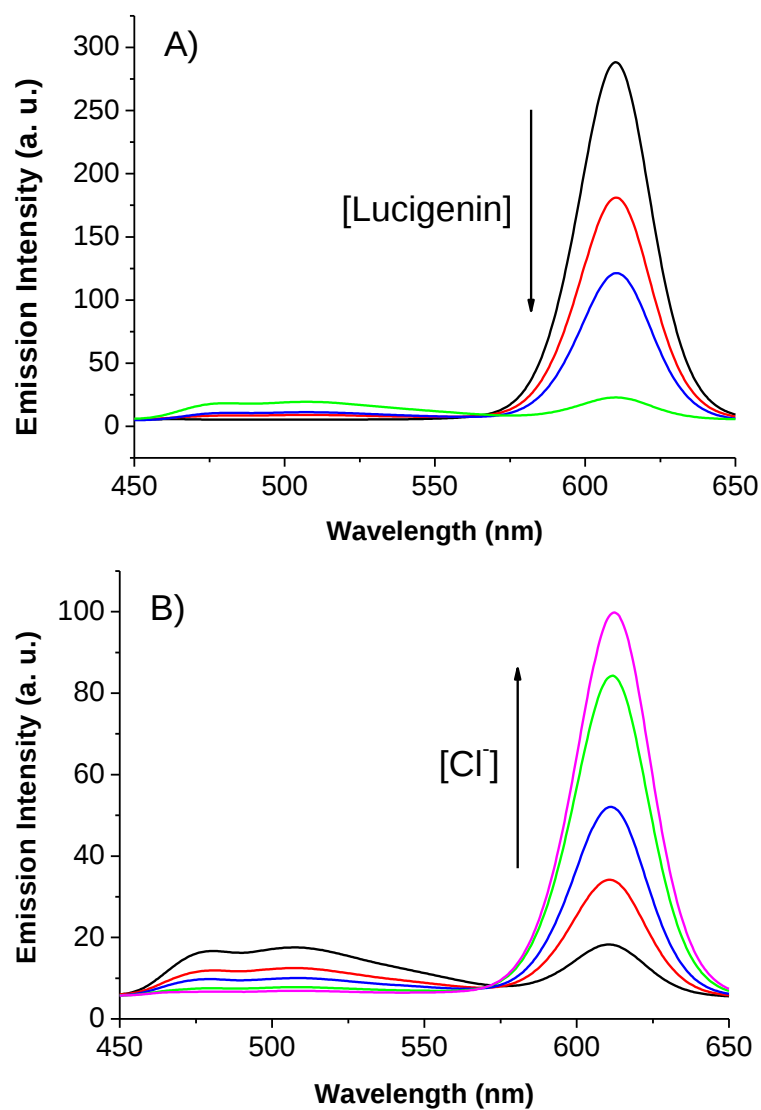


Figure S.2. A) Emission spectra of QD-MPA before (black) and after addition of different amounts of lucigenin: 1×10^{-6} M (red); 2×10^{-6} M (blue) and 4×10^{-6} M (green). B) Emission spectra of QD-lucigenin conjugate before (black) and after addition of chloride ion solutions at different concentrations: 10 mM (red); 20 mM (blue); 50 mM (green); and 100 mM (magenta) ($\lambda_{\text{ex}} = 440$ nm).

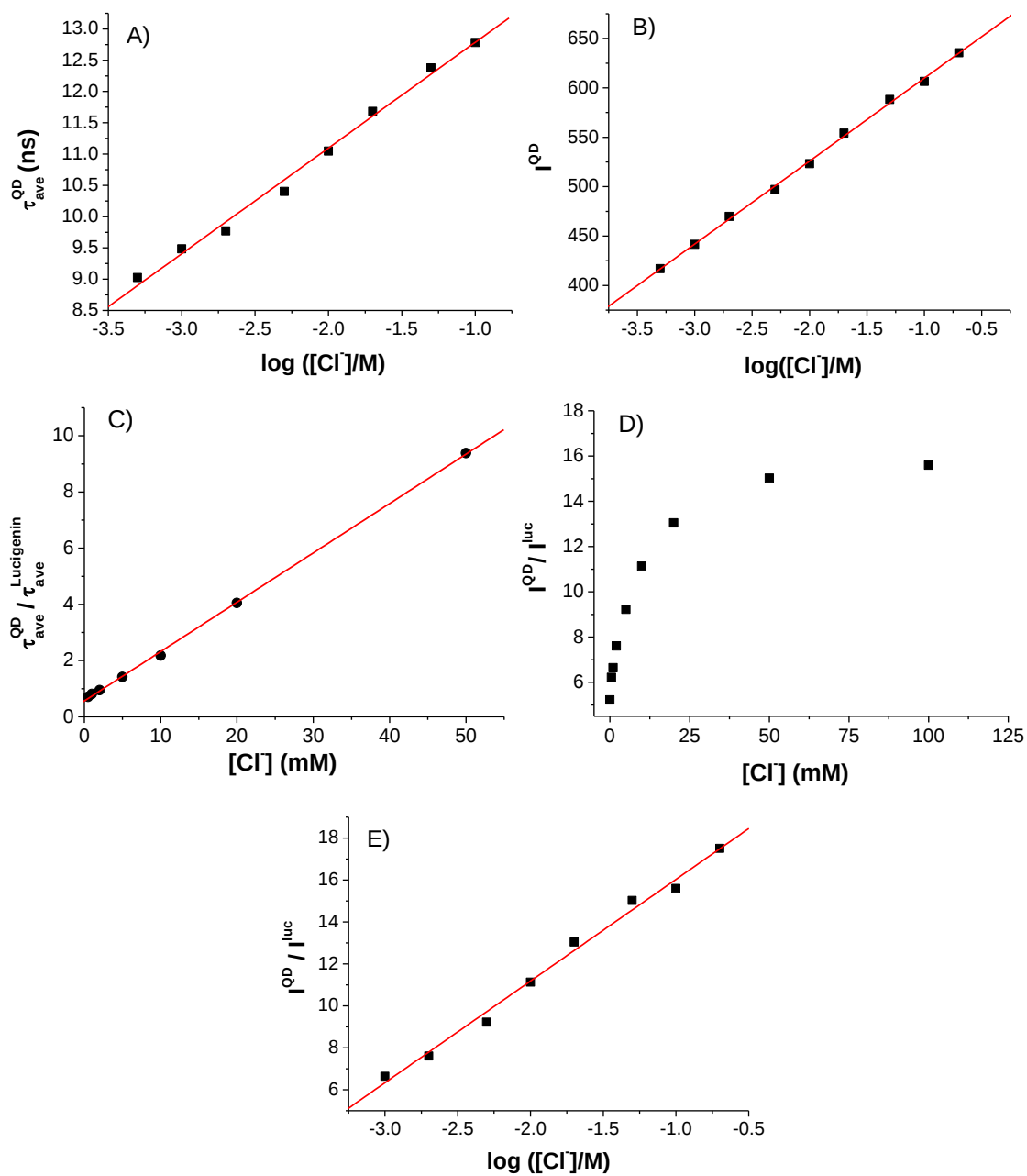


Figure S.3. Different modes for Cl^- determination: A) τ_{ave} of QD-lucigenin conjugate versus the logarithm of the concentration of Cl^- ; B) Emission intensity of QD-lucigenin conjugate versus the logarithm of the concentration of Cl^- ; C) Lifetime ratio ($\tau_{\text{ave}}^{\text{QD}} / \tau_{\text{ave}}^{\text{luc}}$) versus the concentration of Cl^- (mM); D) Intensity ratio ($I^{\text{QD}} / I^{\text{luc}}$) versus the concentration of Cl^- (mM); E) Intensity ratio ($I^{\text{QD}} / I^{\text{luc}}$) versus the the logarithm of concentration of Cl^- (mM).

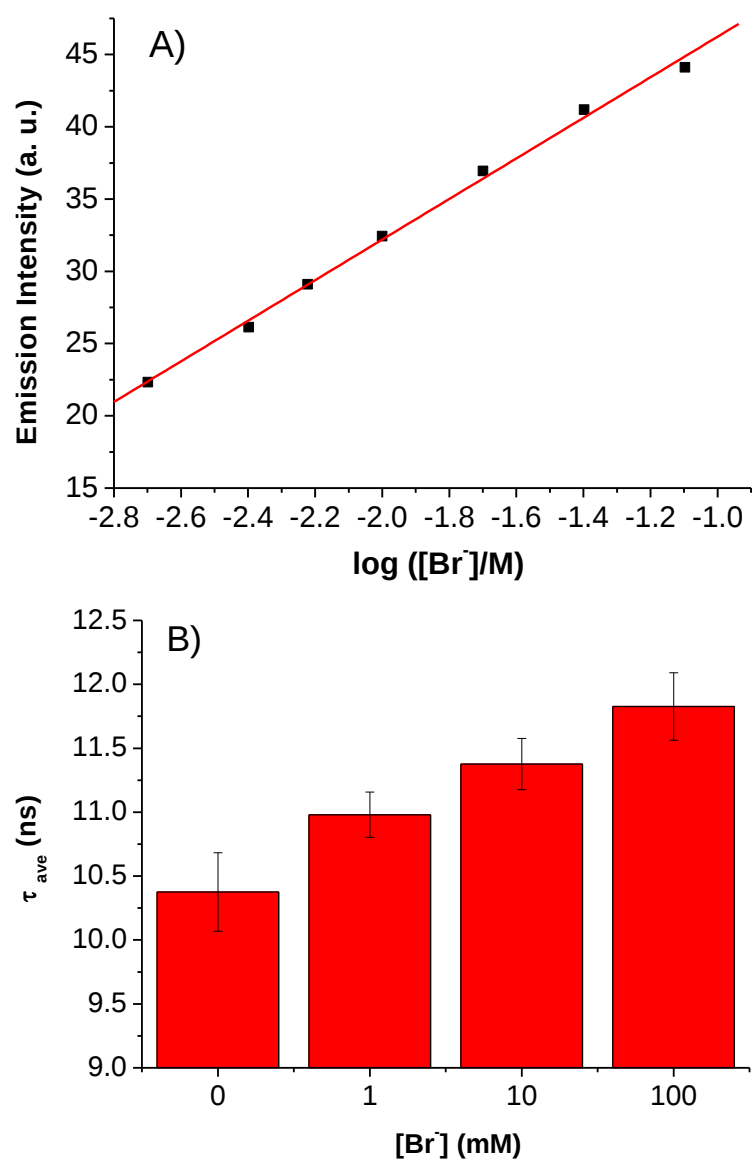


Figure S.4. A) Emission intensity and B) Average lifetime of QD-lucigenin conjugates after addition different concentrations of Br^- (λ_{ex} = 440 nm; λ_{em} = 610 nm).

Table S.1. Examples of lifetimes and normalized pre-exponential factors of QD-MPA and QD-lucigenin conjugates in the absence and the presence of different chloride ion concentrations in milli-Q water ($\lambda_{\text{ex}} = 440 \text{ nm}$; $\lambda_{\text{em}} = 610 \text{ nm}$).

Sample	$\tau_1 \text{ (ns)}^a$	$\tau_2 \text{ (ns)}^a$	$\tau_3 \text{ (ns)}^a$	$\tau_4 \text{ (ns)}^a$	$\tau_{\text{ave}} \text{ (ns)}^b$	χ^2
QD-MPA	22.14 (0.67)	9.67 (0.26)	2.38 (0.07)		20.12 ± 0.37	1.291
QD-lucigenin	15.55 (0.13)	6.88 (0.32)	2.20 (0.29)	0.50 (0.26)	9.68 ± 0.18	1.197
QD-luc + 0.5 mM Cl^-	15.73 (0.15)	7.02 (0.33)	2.31 (0.28)	0.52 (0.24)	10.09 ± 0.21	1.185
QD-luc + 1 mM Cl^-	15.84 (0.17)	7.04 (0.34)	2.19 (0.27)	0.47 (0.22)	10.56 ± 0.18	1.228
QD-luc + 2 mM Cl^-	16.08 (0.18)	7.17 (0.35)	2.23 (0.26)	0.47 (0.21)	10.88 ± 0.20	1.191
QD-luc + 5 mM Cl^-	16.48 (0.19)	7.50 (0.36)	2.33 (0.26)	0.53 (0.19)	11.19 ± 0.23	1.221
QD-luc + 10 mM Cl^-	16.54 (0.20)	7.58 (0.36)	2.41 (0.25)	0.53 (0.19)	11.44 ± 0.24	1.193
QD-luc + 20 mM Cl^-	16.78 (0.22)	7.66 (0.38)	2.32 (0.25)	0.55 (0.15)	11.77 ± 0.23	1.305
QD-luc + 50 mM Cl^-	17.04 (0.23)	7.78 (0.38)	2.32 (0.24)	0.52 (0.15)	12.09 ± 0.23	1.264
QD-luc + 200 mM Cl^-	17.25 (0.25)	8.05 (0.38)	2.49 (0.22)	0.56 (0.14)	12.53 ± 0.24	1.298

^aThe normalized pre-exponential factors are shown in brackets beside the corresponding lifetime.

^bThe average lifetimes were calculated with eq 1.