Fluorescence digital image-based method using carbon quantum dots to evaluate the compliance of a biocidal agent

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Electronic Supplementary Information

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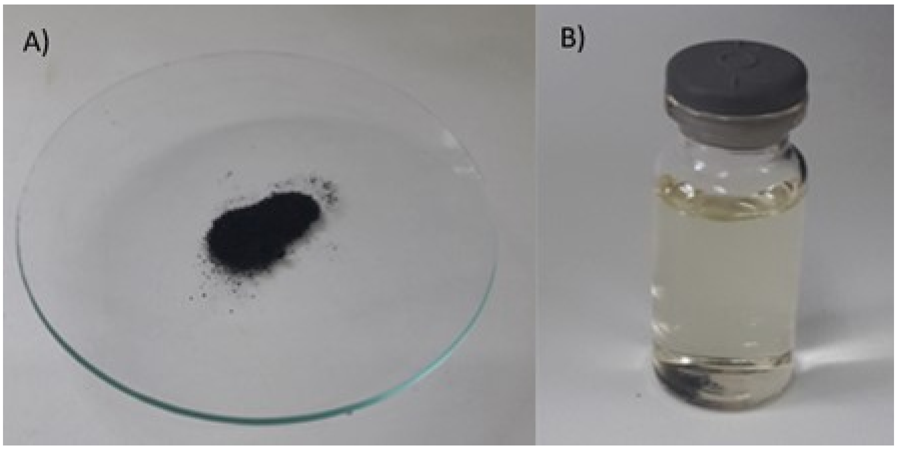


Fig. S1. A) Carbon nanoparticles after extraction, B) CQD solution at a concentration of 1.6 g/L in water.

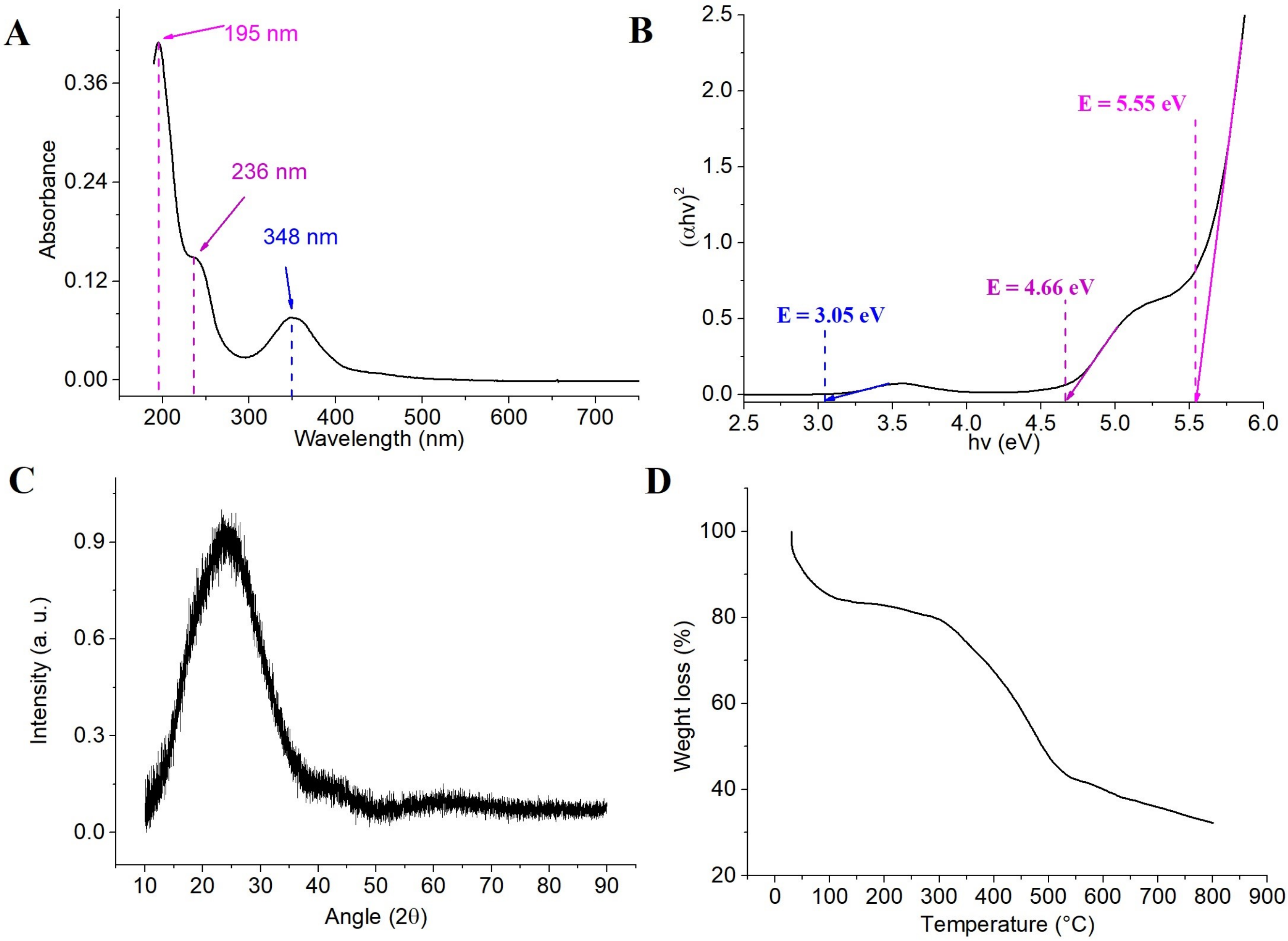


Fig. S2. A) Absorption spectrum of CQD in water using a suspension with 1.6 g/L. B) Tauc plot from the UV-Vis spectrum. C X-ray diffractogram for synthesized CQD and D) Thermogravimetric analysis of CQD nanoparticles.

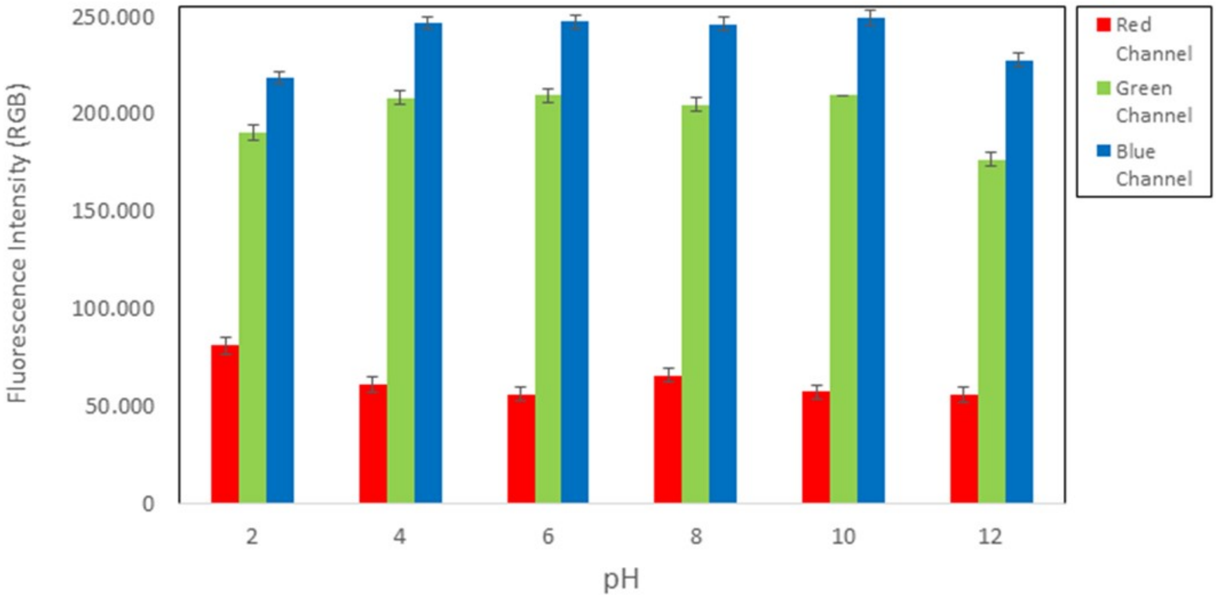
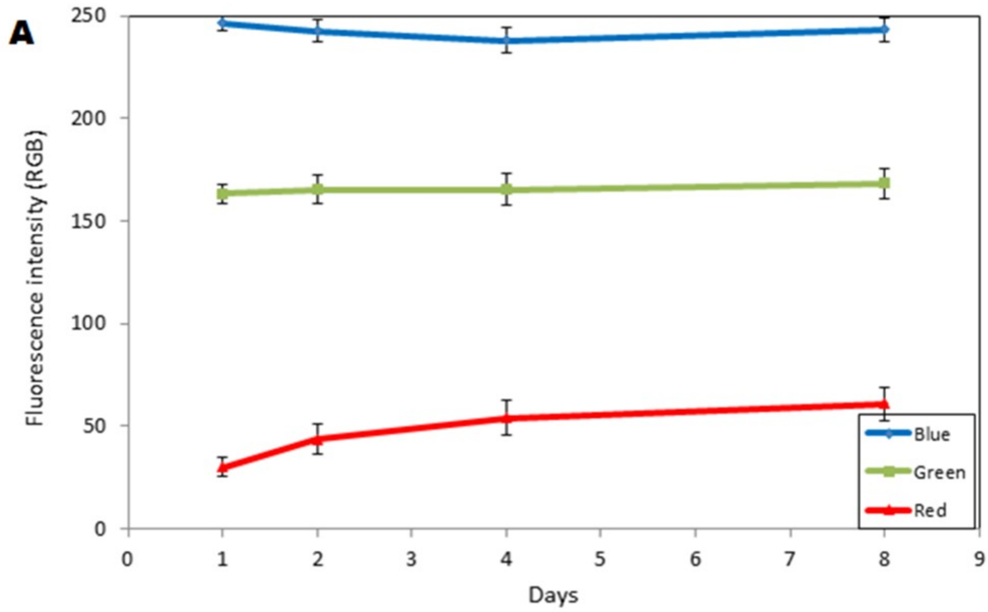


Fig. S3. Study of the influence of pH on the fluorescence of CQDs.



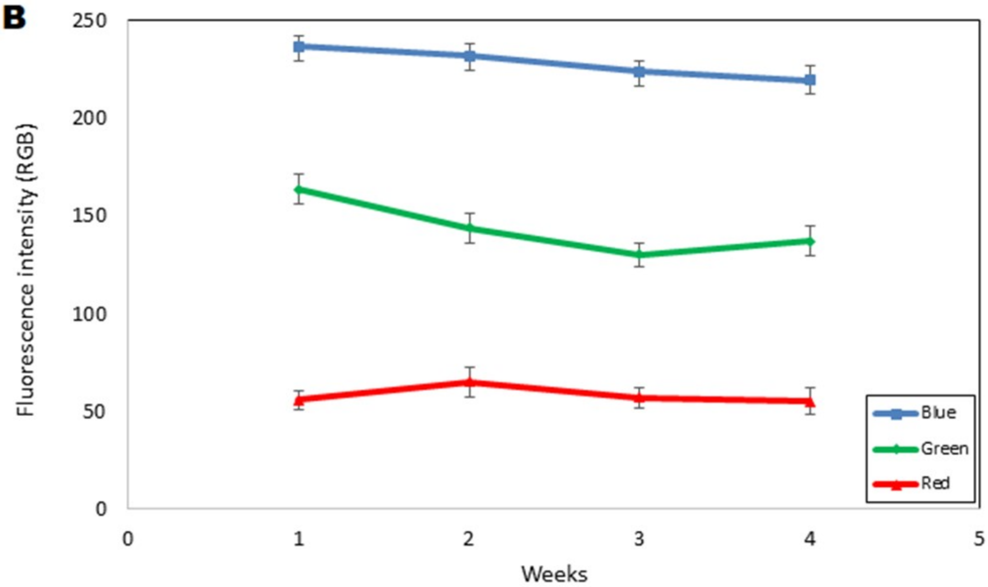
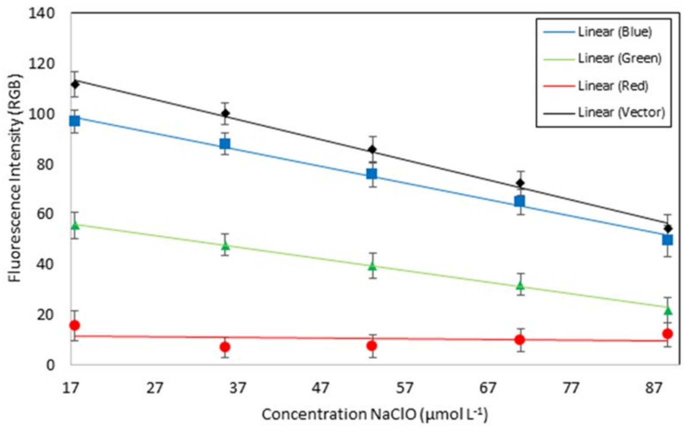


Fig. S4. A) Study of the stability of CQDs regarding fluorescence in one week and B) in one month.

A



B

Fig. S5. A) Analytical curves to detection of hypochlorite using the FDIB from a range of 17.44 µmol L^{-1} to 90 µmol L^{-1} for R, G and B channels and vectorial calculation. B is the solution of 0.16 g / L of CQD in water. B) From 1 to 5 the concentration of hypochlorite was 17.44 µmol L^{-1} (1), 35.44 µmol L^{-1} (2), 53.16 µmol L^{-1} (3), 70.88 µmol L^{-1} (4) and 90 µmol L^{-1} (5), respectively with n = 5.

Table S1. Results of the linear regression for the blue, red, green and vector channels, as well as the coefficient of determination (R^2), LD and LQ values. [NaClO]/mmol L^{-1}

Channel	Linear equation	R^2	LD/µmol L^{-1}	LQ/µmol L^{-1}
Vector (G, B)	y = (- 0.803 ± 0.086) [NaClO] + (127.450 ± 4.872)	0.9935	3.30	10.96
Blue	y = (- 0.662 ± 0.092) [NaClO] + (110.180 ± 5.015)	0.9908	4.00	13.29
Green	y = (- 0.467 ± 0.083) [NaClO] + (64.253 ± 4.854)	0.9973	5.67	18.84

Table S2. Monitoring of the NaClO concentrations in the mat using the FDIB method and a spectrofluorometry used as a reference method. The F-test (tabulated = 19.00) and t-test (tabulated = 12.706) data for a confidence level of 95% with n = 2 is presented.

Time/min	FDIB ([NaClO]/mmol L^{-1})	Spectrofluorometry ([NaClO]/mmol L^{-1})	F-Test	t-Test
5	10.53 ± 0.47	9.84 ± 1.61	11.73	0.469
30	9.39 ± 0.46	10.43 ± 0.30	2.351	1.935
60	9.24 ± 0.49	10.28 ± 0.25	3.842	1.988
90	9.13 ± 0.51	9.97 ± 0.51	1.000	1.165
120	9.12 ± 0.49	8.54 ± 0.42	1.361	0.901
150	8.29 ± 0.40	8.60 ± 0.71	3.151	0.395
180	7.63 ± 0.47	8.24 ± 0.84	3.194	0.659
210	7.24 ± 0.49	8.15 ± 0.85	3.009	0.960
240	7.18 ± 0.47	7.70 ± 0.32	2.157	0.931
270	0.17 ± 0.59	0.43 ± 0.87	2.174	0.252
300	0.02 ± 0.32	0.06 ± 0.52	2.641	0.067

