O/N-carbon dots as a fluorescent nanoprobe for sensitive COX-2 inhibitor detection: comprehensive validation and application to pharmacokinetic studies in rats with acute liver injury

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Quantum yield

We determined the quantum yield (QY) of the O/N-CDs using aqueous quinine sulfate (QS) as a reference (QY = 0.54 in 0.1 M H_2SO_4). For both O/N-CDs and QS, we measured absorbance (<0.05) and recorded emission spectra under identical conditions. The QY was calculated from the integrated emission areas using:

$$\Phi_{O/N\text{-}CDs}=\Phi_{QS}(F_{O/N\text{-}CDs}/F_{QS})\ (A_{QS}/A_{O/N\text{-}CDs})\ (\eta_{O/N\text{-}CDs}/\eta_{QS})^2$$

$\Phi_{O/N\text{-}CDs}$ denotes the QY of O/N-CDs, while ϕ_{QS} indicates the QY of QS. $F_{O/N\text{-}CDs}$ corresponds to the fluorescence intensity of O/N-CDs, and F_{QS} represents the fluorescence intensity of QS. A signifies the absorbance value, and η represents the refractive index of the solvent, specifically distilled water. The synthesized O/N-CDs were dissolved in distilled water, which has a refractive index of 1.33, while QS was dissolved in a 0.1 M H_2SO_4 solution, also with a refractive index of 1.33.

Figures

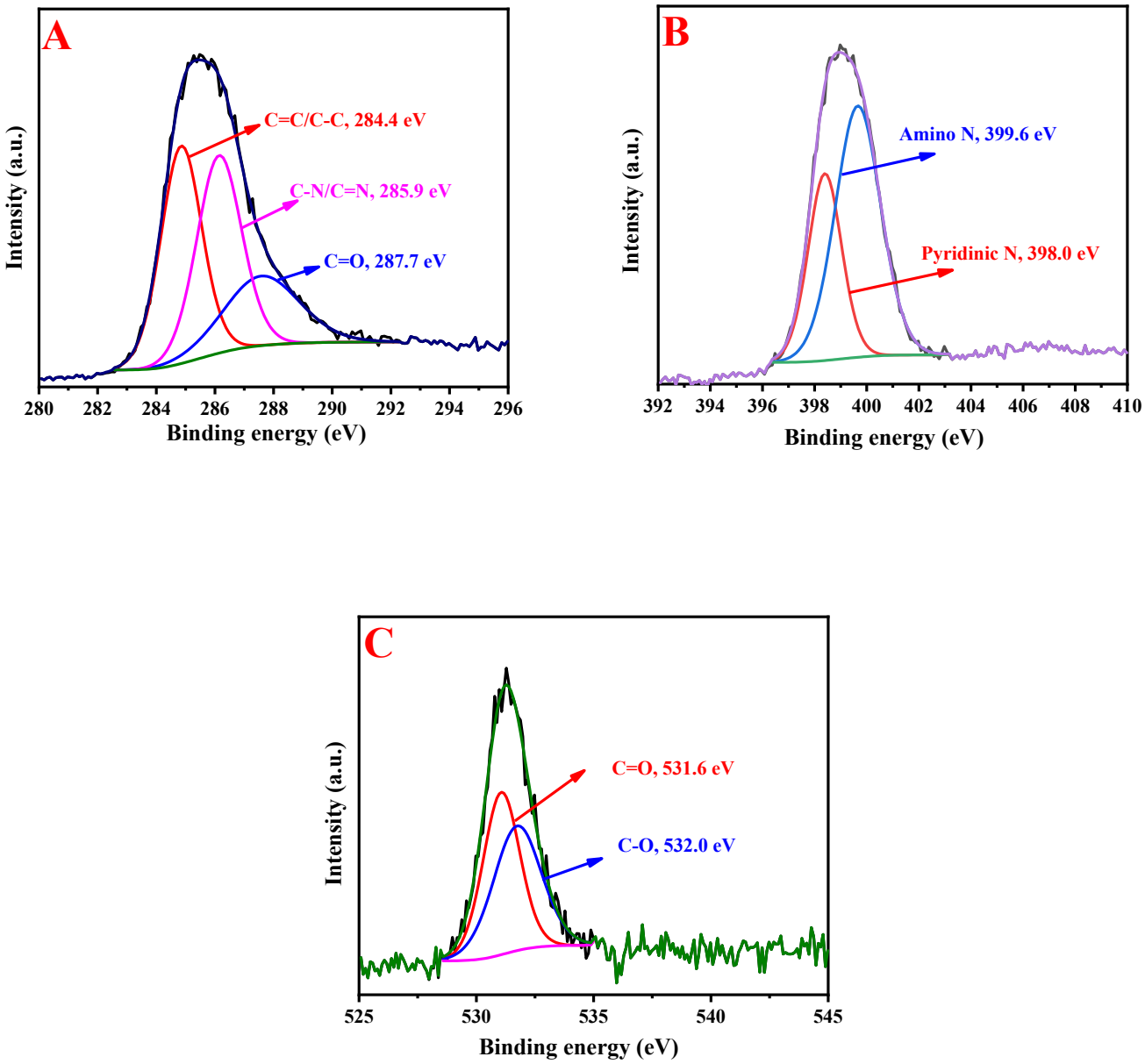


Fig. S1 (A) C 1s, (B) N 1s, and (C) O 1s spectra of O/N-CDs.

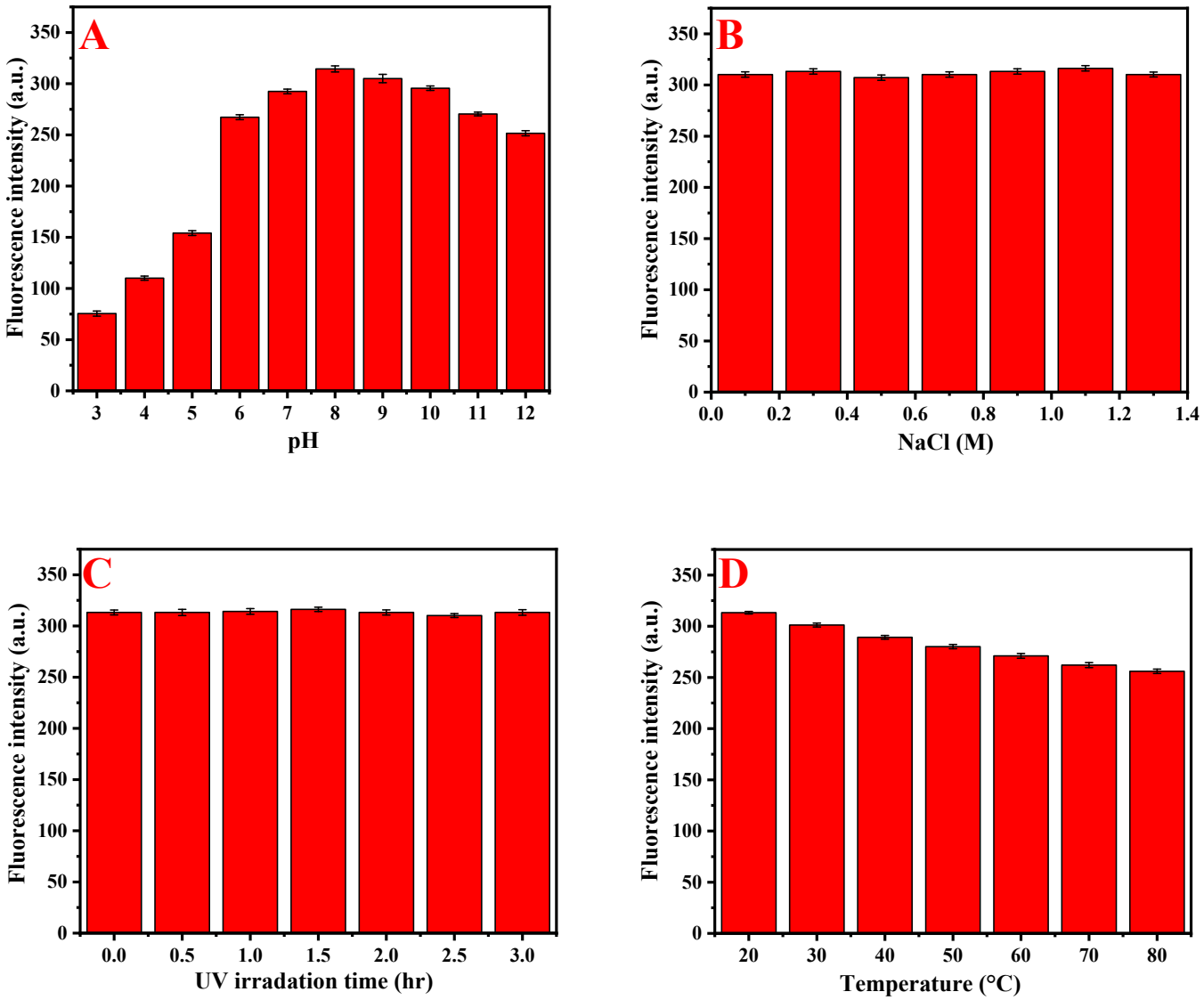


Fig. S2 The influence of (A) pH (3–12), (B) ionic strength (0.1-1.3 M), (C) UV irradiation duration (0-3 hr), and (D) temperature (20–80 ◦C) on the fluorescence intensity of O/N-CDs.

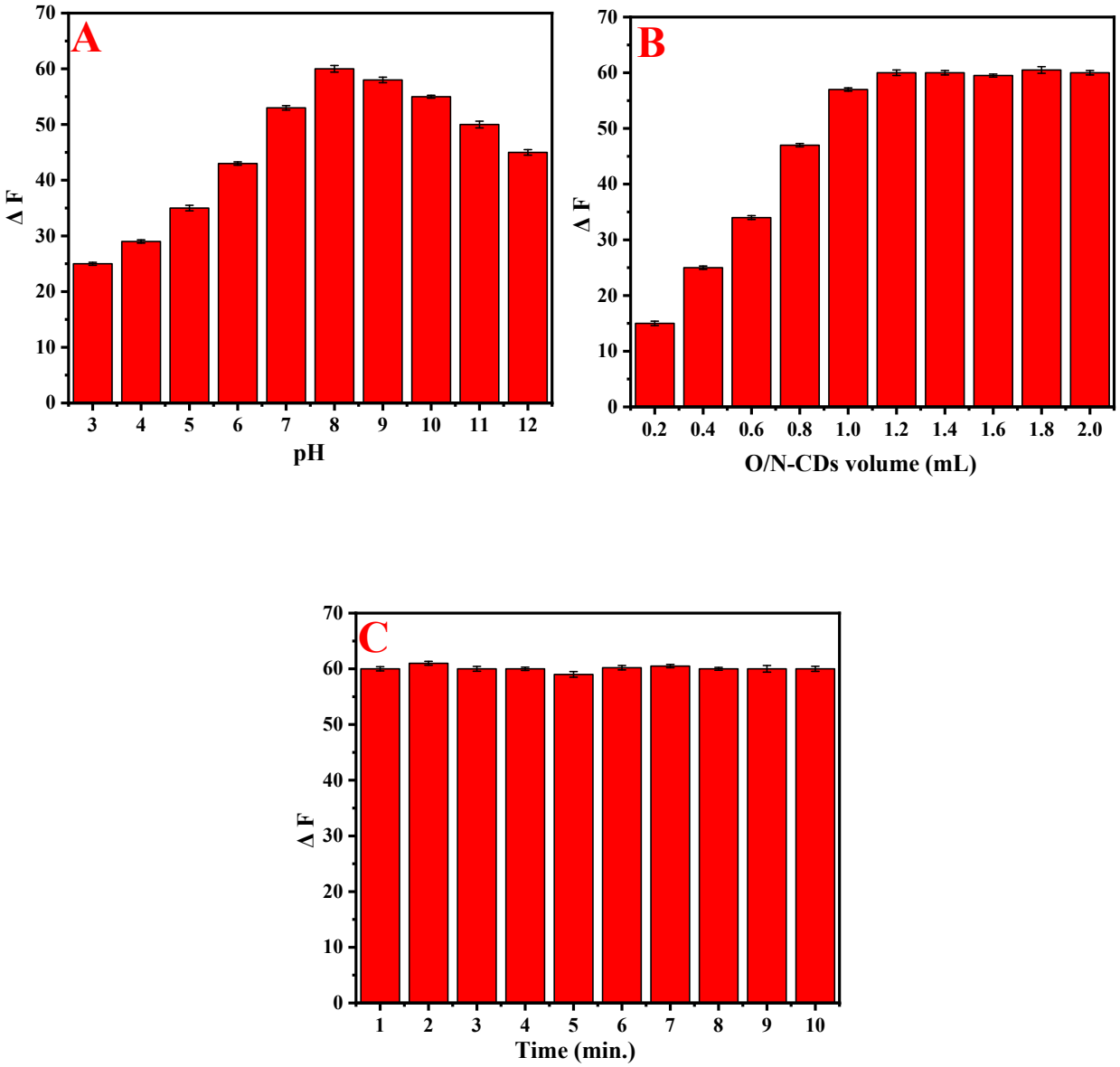


Fig. S3 Influence of the factors affecting ΔF and interactions between O/N-CDs and ETX (200 ng/mL) (A) pH (3–12), (B) volume of O/N-CDs (0.2-2 mL), (C) incubation time (1-10 min.).

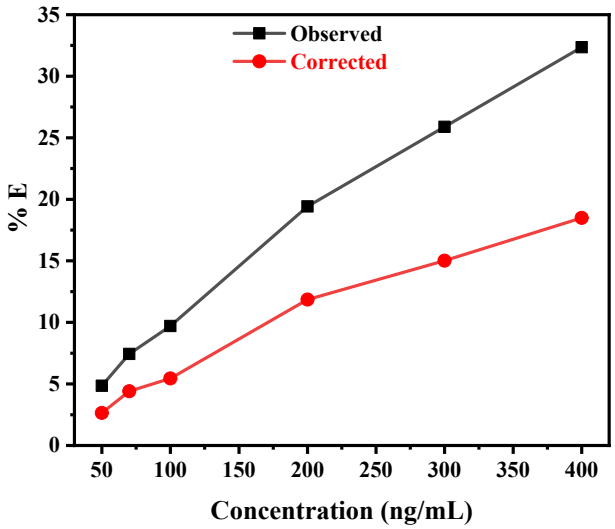
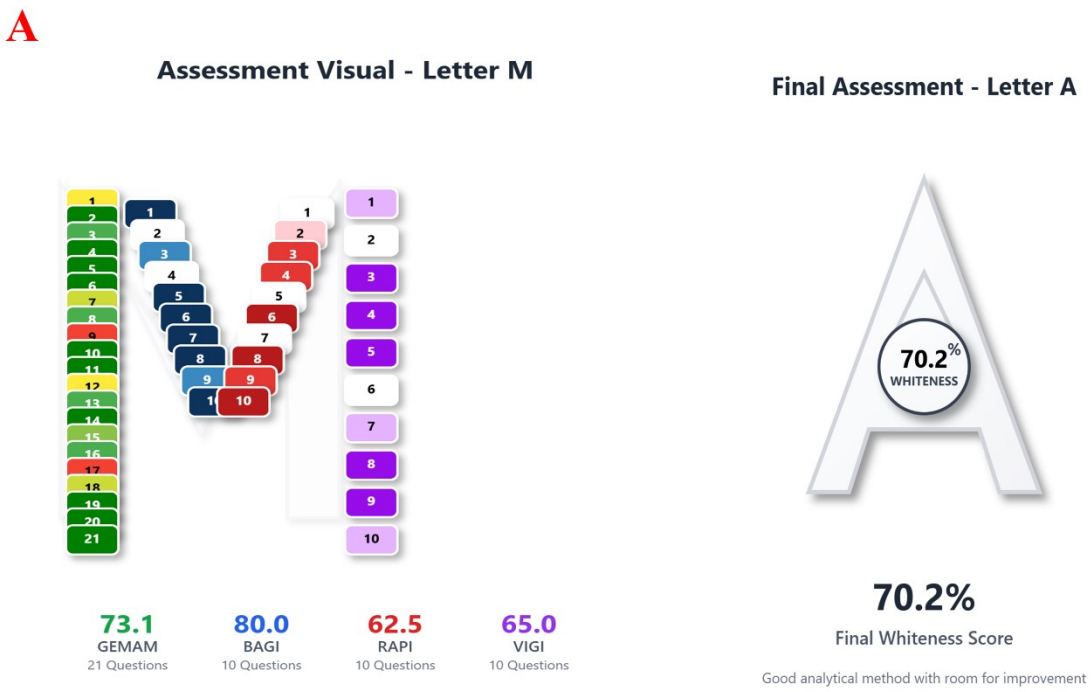


Fig. S4 Suppressed efficiency (%E) of observed and corrected fluorescence of O/N-CDs after the addition of ETX.



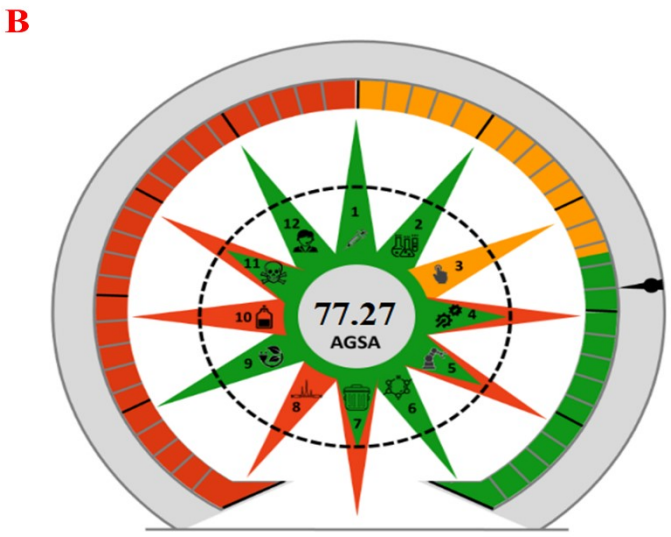


Fig. S5 (A) MA whiteness assessment score (B) AGSA score of the method developed to determine O/N-CDs and ETX mixture.

Tables

Table S1: Accuracy and precision studies of ETX

Conc. (ng/mL)	Accuracy	Precision	
		Intra-day	Inter-day
	%Recovery± SD *(n=6)*	**% Recovery± % RSD** *(n=3)*	**% Recovery± % RSD** *(n=9)*
70	98.48 ± 0.94	99.57 ± 0.86	99.92 ± 1.29
400	100.11 ± 1.37	100.36± 1.02	98.79 ± 1.77
1000	99.05 ± 1.58	99.58 ± 1.29	100.67± 2.17

Table S2: The quantitative statistical data for determining ETX using the proposed method in rat plasma.

Parameter	Values
Linearity range (ng/mL)	50- 1000
Intercept ± SD	2.53± 1.35
Slope± SD	0.27± 0.34
Correlation coefficient (r)	0.9991
Coefficient of determination (r^2)	0.9984
LOD (ng/mL)	16.21
LOQ (ng/mL)	49.11