

Supplementary material

Novel colorimetric paper-based test strip for point of use quality testing of ethanol-based hand sanitizer

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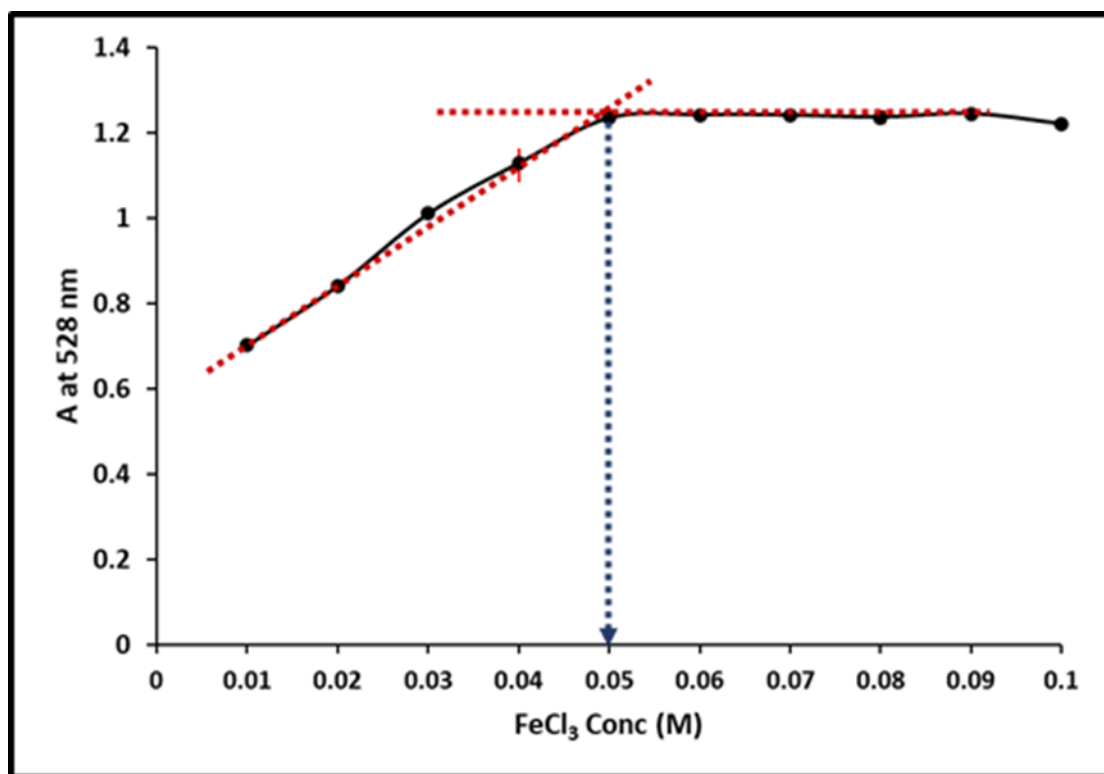


Fig. S1. Determination of reaction stoichiometry using Molar-ratio method for Fe³⁺ (0.01 - 0.1 M), and MPB 0.2 M (absorbance recorded at 528 nm).

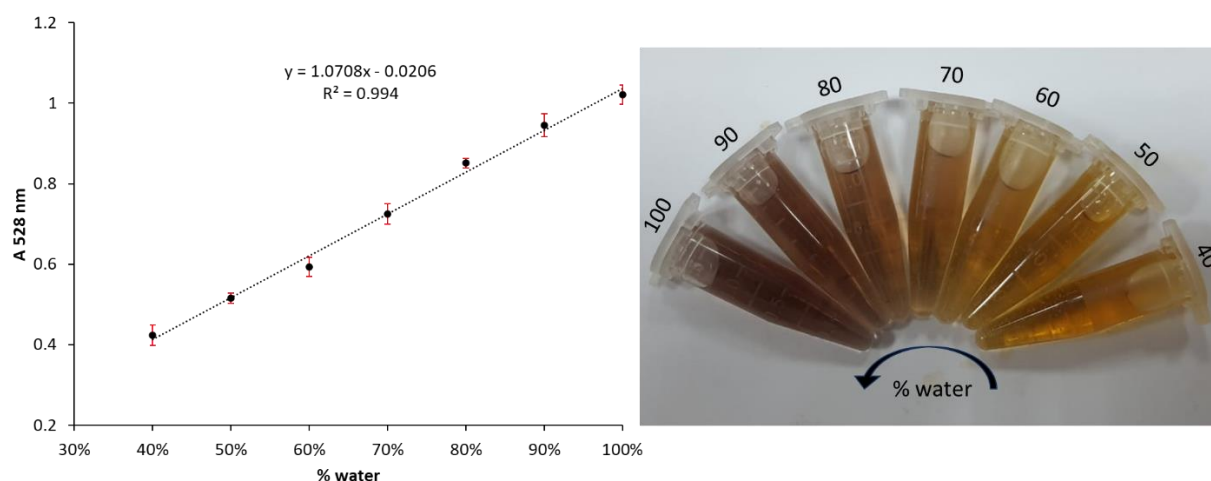


Fig. S2. The linear relationship between the developed color and water content (%) using the developed MPB-Fe³⁺ sensor within the range of 40–100% (inset: photos of color change using the developed MPB-Fe³⁺ sensor within the range of 40–100%).

a	0.1	0.2	0.3	0.4	0.5	
	CHT (g%)					
b	0.08	0.1	0.125	0.17	0.25	0.5
	FeCl ₃ (M)					
c	20	40	60	80	100	
	MPB (mg/mL)					

Fig. S3. Optimization of PAD preparation conditions. (a) effect of chitosan (CHT) concentration in g%, (b) effect of FeCl₃ concentration in moles, (c) effect of methyl paraben (MPB) concentration in mg/mL on the developed color developed using 70% ethanol.










































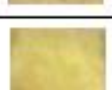













Ethanol content (%)	Determinations					Water content (%)
	1	2	3	4	5	
0						100
10						90
20						80
30						70
40						60
50						50
60						40
70						30
80						20
90						10
100						0

Fig. S4. Reproducibility results for the determination of water content (0-100%) in ethanol using the developed paper-based test strip.

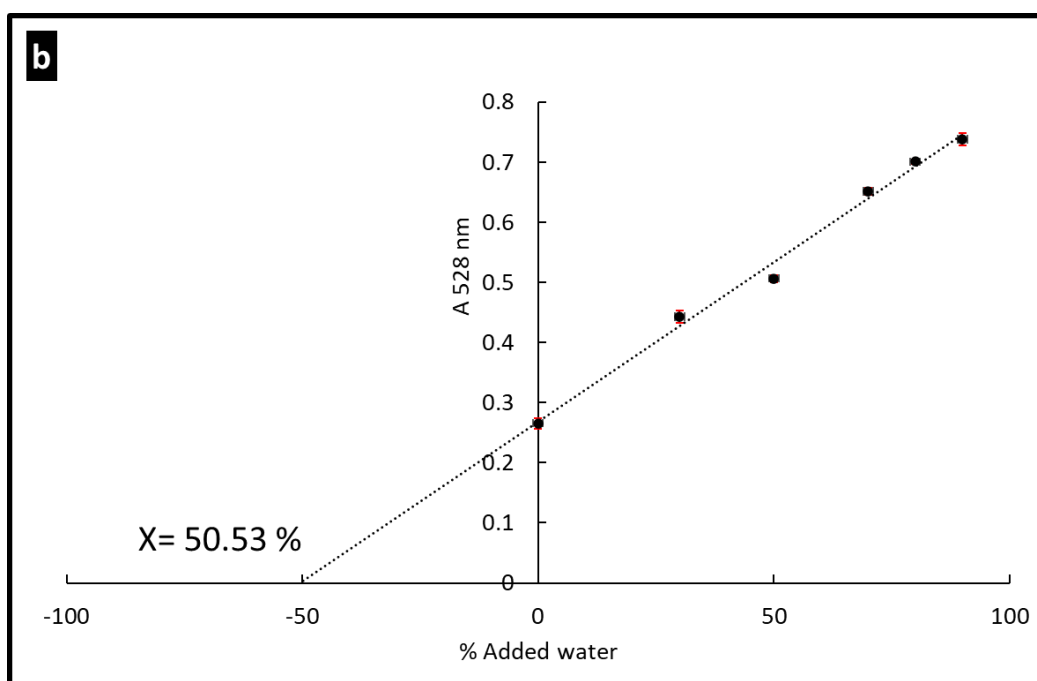
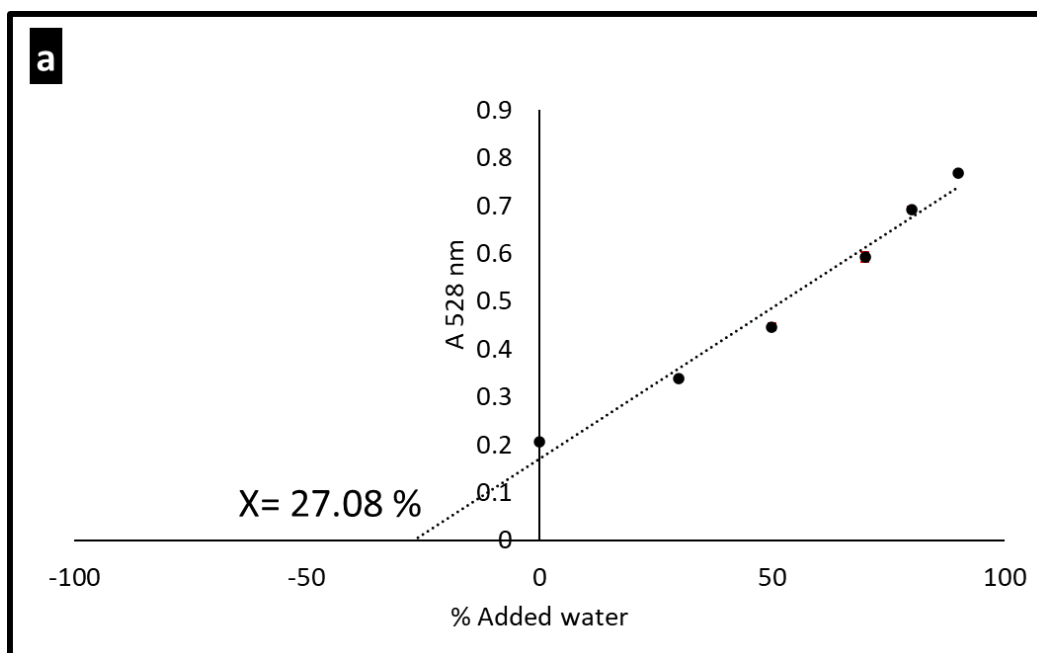


Fig. S5. Determination of water content in (a) product I and (b) product II using the proposed spectroscopic method applying standard addition calibration.

Table S1. Reported analytical methods for water content determination in different samples compared with the proposed SPCDs sensor.

Method/Principle	Sample	Time	Linearity range	DL	Ref.
Karl Fischer titration	Food and pharmaceutical samples	NR*	NR*	0.03%	¹
Spectrofluorimetric/ AgNCs	Ethanol and DMSO	Preparation: 10 h Incubation: 2 min	20-55%	4.48%	²
Spectrofluorimetric/ CDs@MOF	Organic solvents (ethanol, acetone, ACN)	Preparation: 60 min Incubation: 45 min	0–70%	0.70% v/v	³
¹H NMR chemical shifts differences	Organic solvents	NR*	0.5-5%	NR*	⁴
Colorimetric/ FeCl₃-MPB	Ethanol and ethanol-based hand sanitizers	Preparation: 0 min Incubation: 0 min	40-100%	0.088 %	This work
FeCl₃/MPB@CHT-paper	Ethanol and ethanol-based hand sanitizers	Preparation: 10 min Incubation: 0 min	0-100%	-	This work

* Not reported.

References:

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- 2 N. Kong, H. Yuan, H. Zhou, Y. Zhao and S. Zhang, *Anal. Methods*, 2021, **13**, 2722–2727.
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