Electronic supplementary information (ESI)

Ultrasensitive fluorescence detection of antitumor drug methotrexate based on terbium doped silica dendritic probe

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Figures

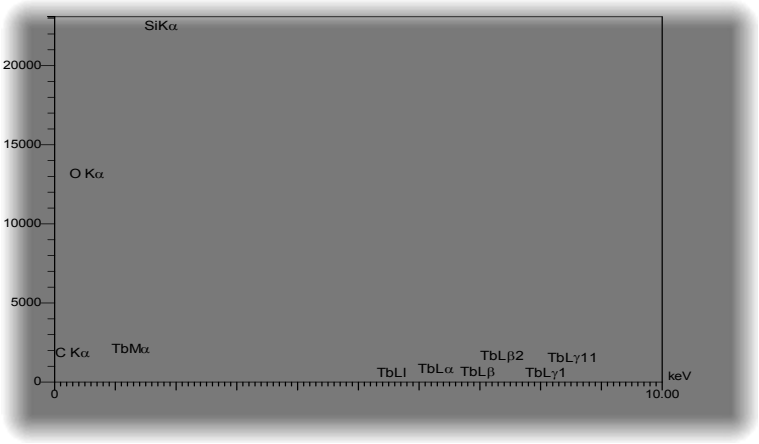


Fig. 1S. EDX elemental composition of the Tb-dopped-KCC-1.

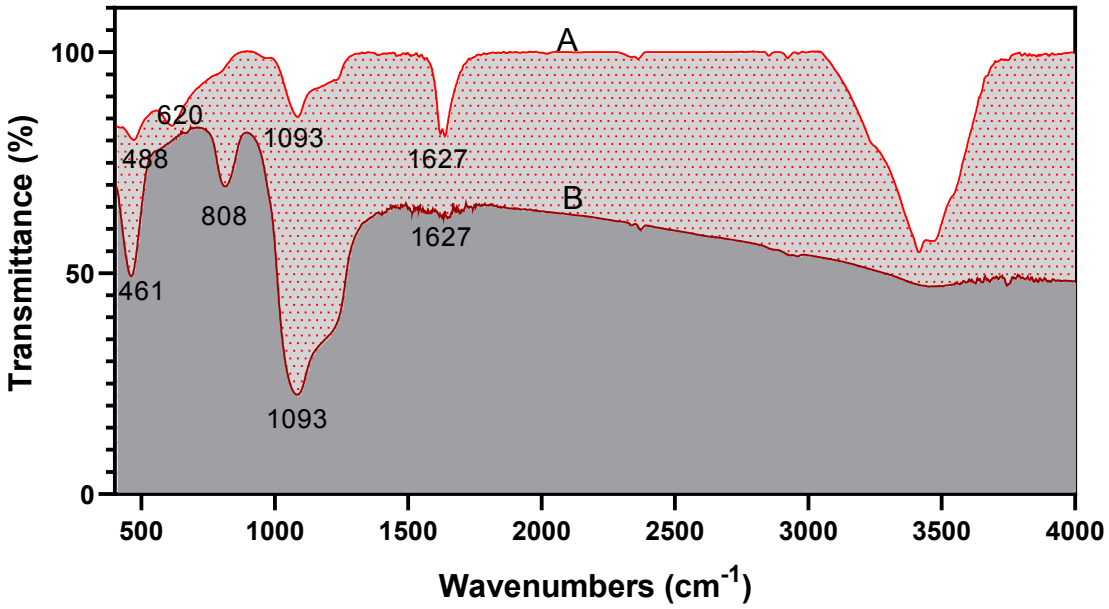
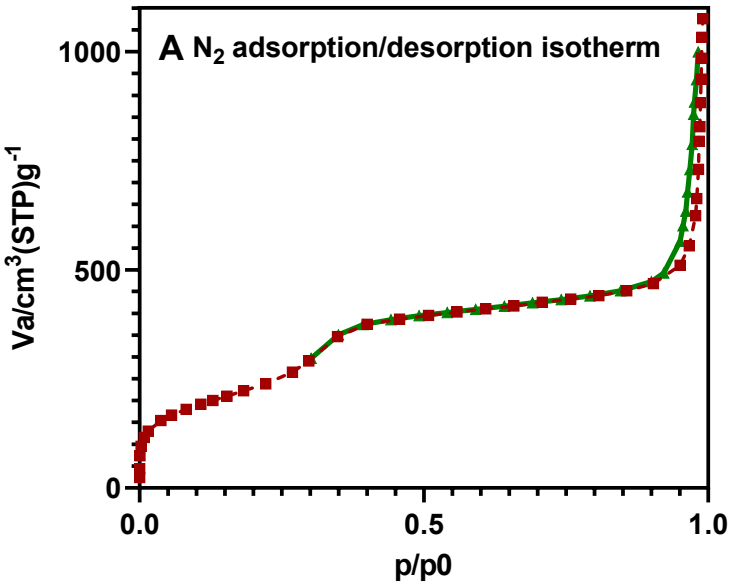
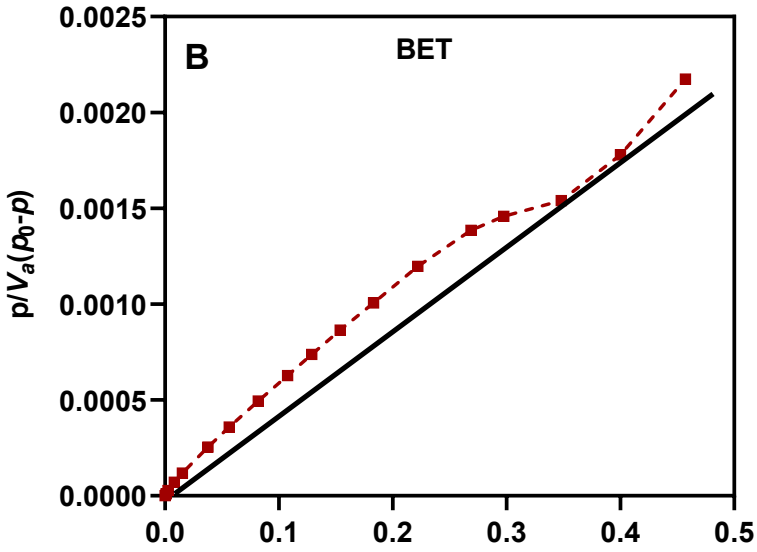


Fig. 2S. Comparison of FTIR spectra of the (A) Tb@KCC-1 and (B) KCC-1[1].


A N2 adsorption/desorption isotherm
1000
500
0
Va/cm3(STP)g-1
0.0
0.5
1.0
p/p0


B
BET
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
p/Va(p0-p)
0.0
0.1
0.2
0.3
0.4
0.5

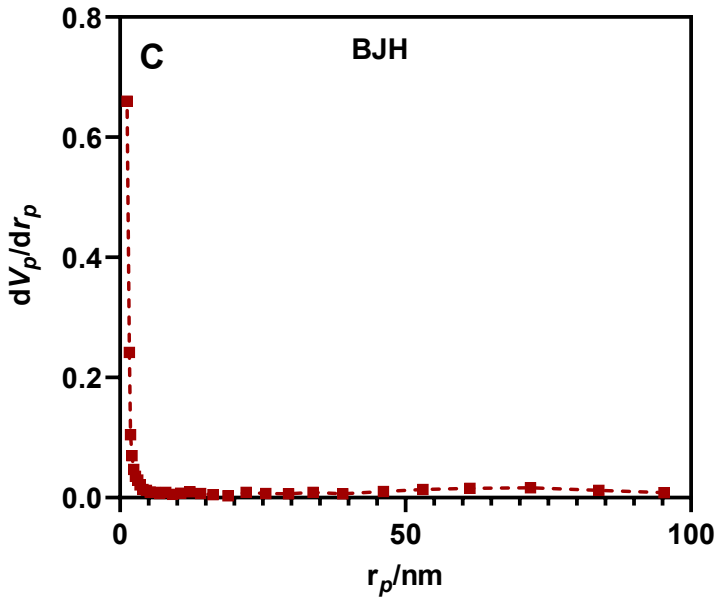


Fig. 3S. Nitrogen adsorption/desorption isotherm, BET, and BJH of Tb@KCC-1 (P/P0= relative pressure (surface pressure/preliminary pressure)).

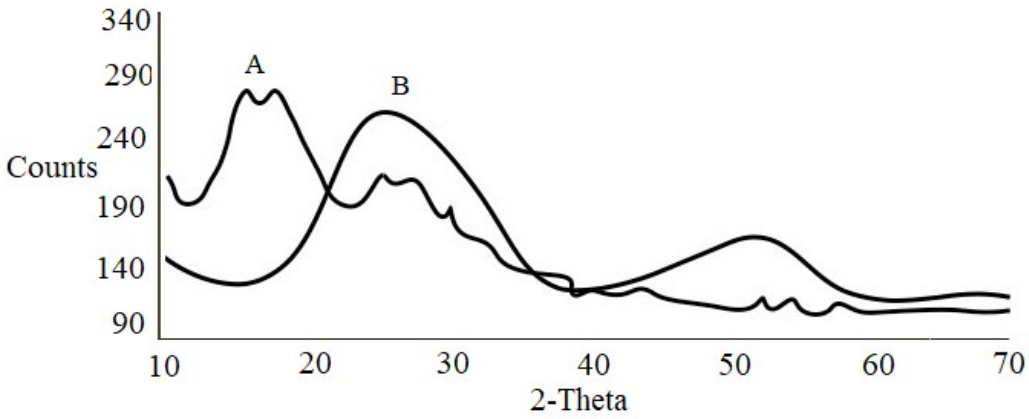
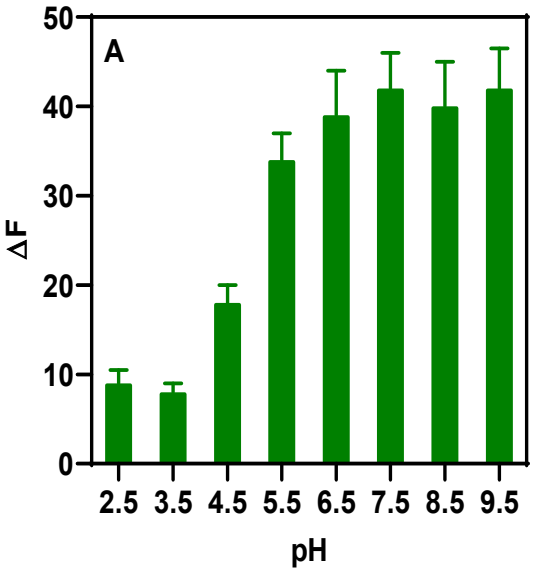
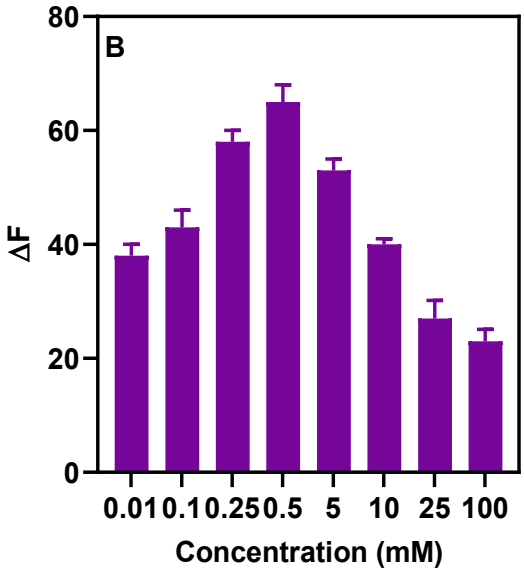
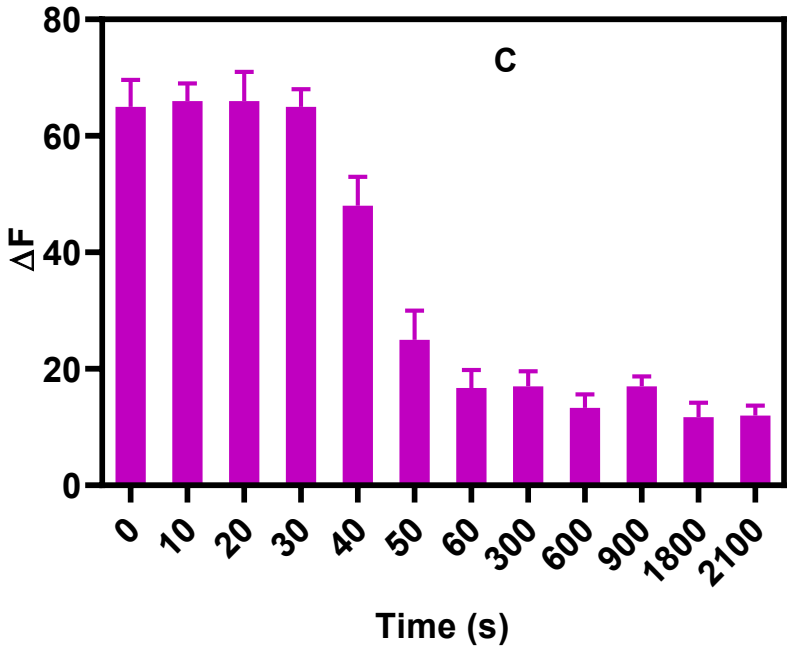


Fig. 4S. (A) KCC-1 bare and (B) Tb@KCC-1.


A
ΔF
50
40
30
20
10
0
2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5
pH


B
ΔF
80
60
40
20
0
0.01 0.1 0.25 0.5 5 10 25 100
Concentration (mM)


C
ΔF
80
60
40
20
0
0 10 20 30 40 50 60 300 600 900 1800 2100
Time (s)

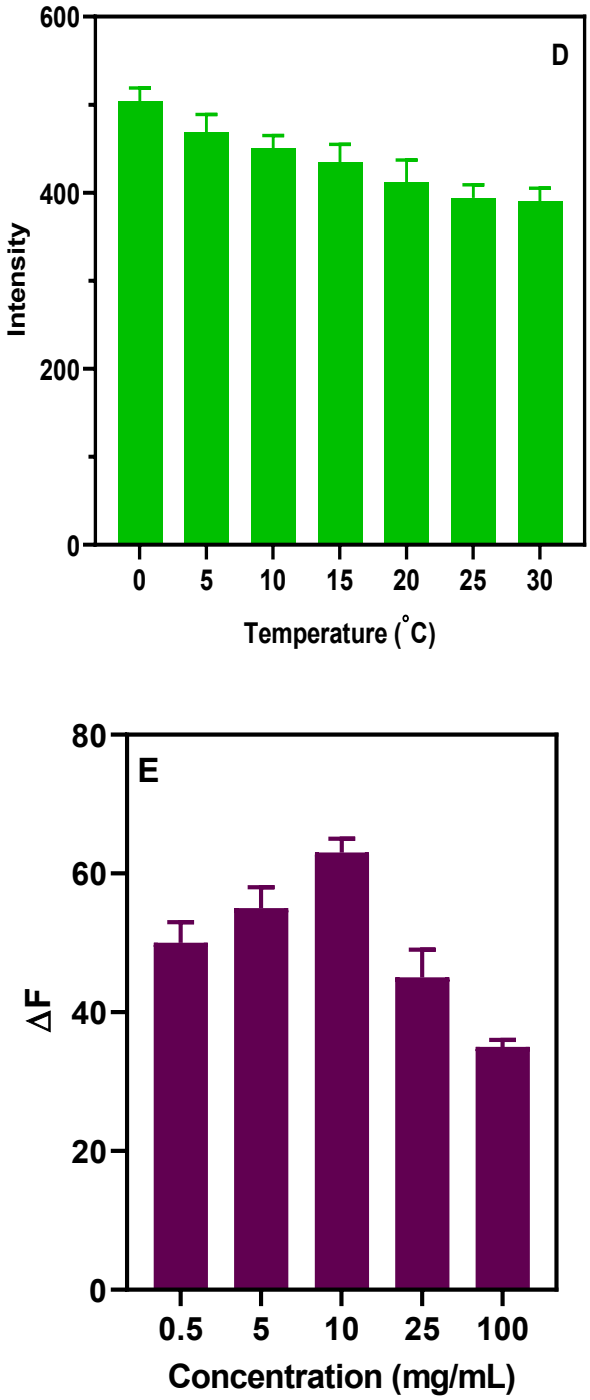


Figure 5S. Influence of the factors on the florescence emission and interactions between Tb@KCC-1 and MTX (1 µg/mL). (A) pH, (B) buffer concentration, (C) incubation time, (D) temperature, and (E) concentration of the nanocomposite.

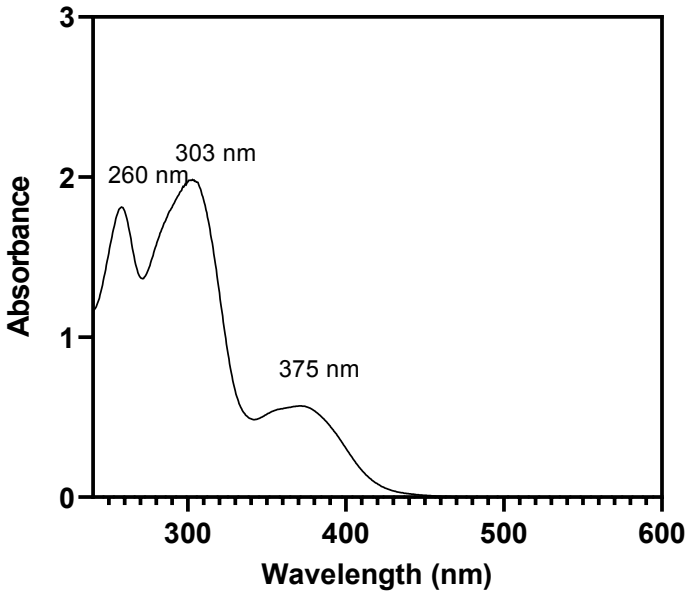
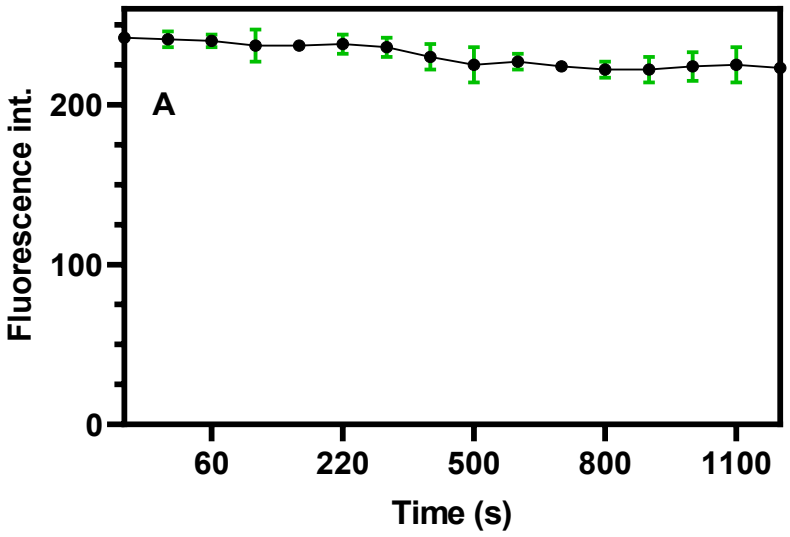
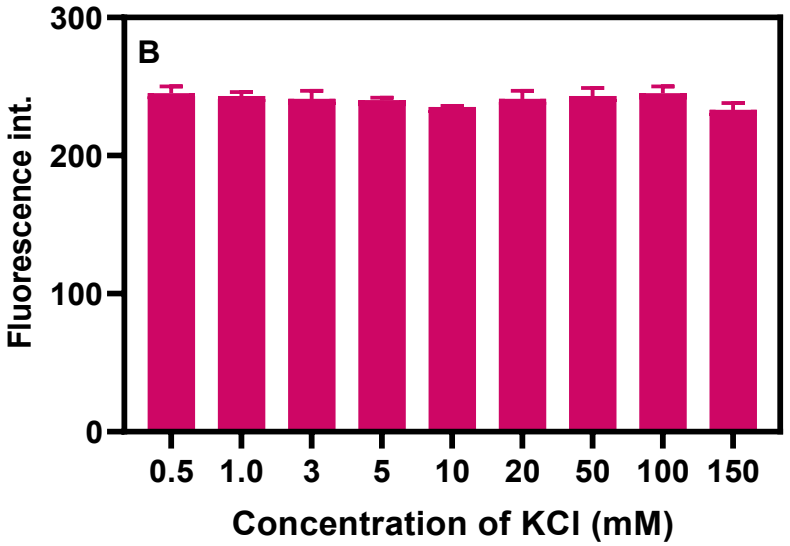


Figure 6S. Absorption spectrum of MTX.


A
Fluorescence int.
0
100
200
60
220
500
800
1100
Time (s)


B
Fluorescence int.
0
100
200
300
0.5
1.0
3
5
10
20
50
100
150
Concentration of KCl (mM)

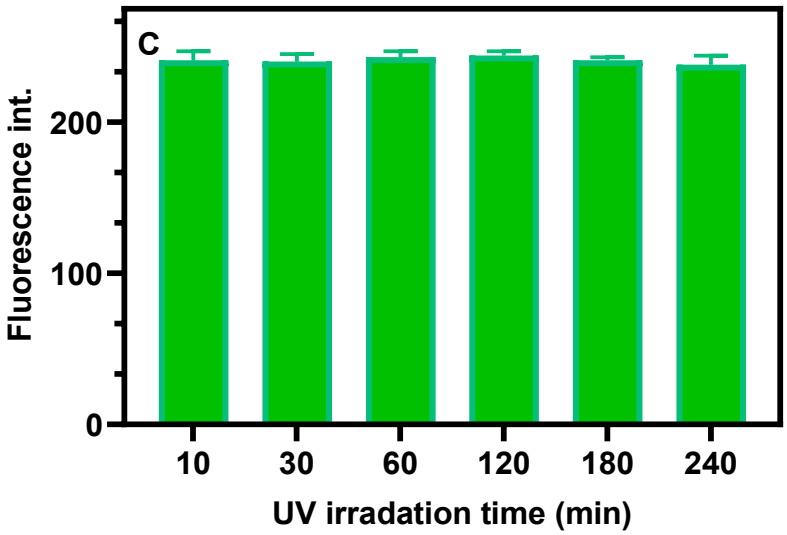


Figure 7S. (A) Time (s), (B) ionic strength (mM), and (C) UV irradiation time stability of the developed method probe (min) (Conditions are as reported for Figure 3.)

Tables

Table 1S. EDX analysis data of Tb-doped dendritic KCC-1.

Element	W%	A%
C	12.16	19.32
O	42.39	50.55
Si	44.10	29.97
Tb	1.35	0.16
Total	100.00	100.00

Table 2S. Effect of Tb loading on the surface area and pore volume

Substance	Surface area (m^2/g)	Pore volume (cm^3/g)	Pore size (nm)	Reference
KCC-bare	617.41	1.5	9.9	[2]
Tb@KCC-1	638.96	1.6	6.6	This work

Table 3S. Effects of common interferent substances on the determination of MTX using Tb@KCC-1 probe. (Concentration of MTX is 1 μg/mL and conditions are as reported for Figure 3).

Substance	Ratio (MTX : Interfering agent)	**RSD%**		**ΔF**	
		Plasma	EBC	Plasma	EBC
K^+	1:200	4.5	5.0	3.5	4.0
	1:400	6.0	8.9	4.7	7.1
Zn^{2+}	1:1	9.4	23	7.3	18.4
Cu^{2+}	1:0.1	2.7	5.4	2.1	4.3
	1:10	11	12	8.6	9.6
Fe^{3+}	1:0.1	3.1	6.5	2.4	5.2
	1:10	8.0	10	10.1	11.2
NH_4^+	1:0.1	6.9	7.02	5.4	5.6
Al^{3+}	1:0.1	8.5	6.9	6.6	5.5
	1:10	13	15	10.1	12.0
Na^+	1:0.1	7.2	7.3	5.6	5.8
	1:1000	6.0	5	4.7	4.0
Cl^-	1:1	7.1	12	5.5	9.6
	1:20	8.0	7.0	6.2	5.6
HCO_3^-	1:1	4.0	5.0	3.1	4.0
Ca^{2+}	1:0.1	3.5	6.0	2.7	4.8
	1:1	12	13	9.4	10.4
Mg^{2+}	1:1	5.0	5.0	3.9	4.0
	1:20	13	14	10.1	11.2
Acetate	1:1	7.2	7.3	5.6	5.8
Phosphate	1:1	5.2	3.0	4.1	2.4
L-Leucine	1:0.1	11.7	9.5	9.1	7.6
	1:10	14	15	10.9	12.0
Ascorbic Acid	1:0.1	1.1	7.3	0.9	5.8
L-Cysteine	1:0.1	6.3	8.0	4.9	6.4
	1:10	13	12	10.1	9.6
Uric acid	1:0.1	3.0	4.0	2.3	3.2
	1:10	10	11	7.8	8.8
Lactose	1:1	4.0	2.0	3.1	1.6
Sucrose	1:1	6.0	6.0	4.7	4.8
Fructose	1:1	5.0	9.0	3.9	7.2
Urea	1:0.1	2.0	3.0	1.6	2.4
	1:20	11	12	8.6	9.6
Citric acid	1:1	2.5	1.0	2.0	0.8
	1:10	6.0	8.0	4.7	6.4

References

1. J. Soleymani, M. Hasanzadeh, N., Shadjou, M. H. Somi, and A. Jouyban, *Journal of pharmaceutical and biomedical analysis,* 2020**, 180**, 113077.

2. J. Soleymani, M. Hasanzadeh, M. H. Somi, N. Shadjou and A. Jouyban, *Biosensors and Bioelectronics*, 2019, **132**, 122-131.