Electronic Supplementary Information

Ascorbic Acid Functionalized Anti-Aggregated Au Nanoparticles for Ultrafast MEF and SERS Detection of Tartrazine: An Ultra-Wide Piecewise Linear Range Study

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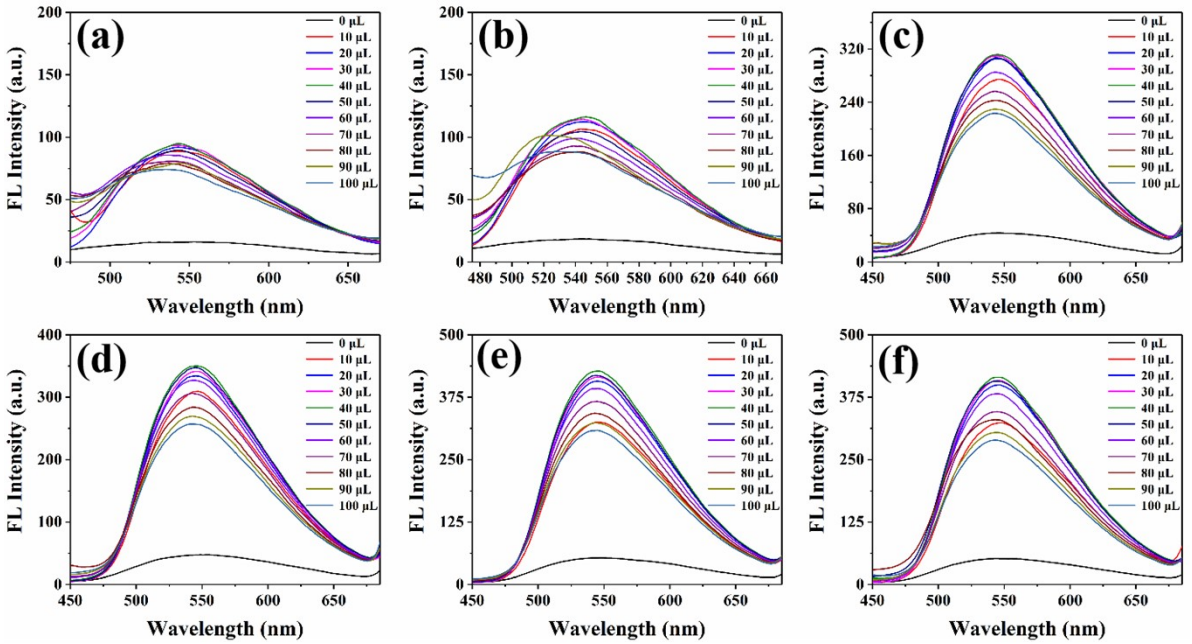

Figure S1. Fluorescence emission spectra of different concentrations of tartrazine solutions: (a) 8 µM, (b) 10 µM, (c) 40 µM, (d) 50 µM, (e) 70 µM, (f) 80 µM after adding different volumes of AuNPs.

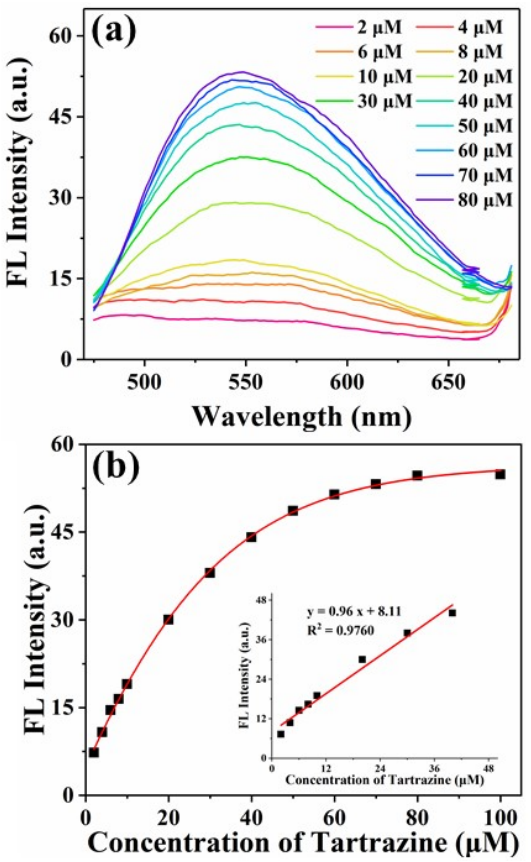

Figure S2. (a) Fluorescence spectra and (b) fluorescence intensity (~547 nm) of tartrazine at different concentrations without AuNPs. Inset: the line relationship between the intensity and the tartrazine concentration in the range of 2-40 μM. The limit of detection was found to be 324.8 nM.

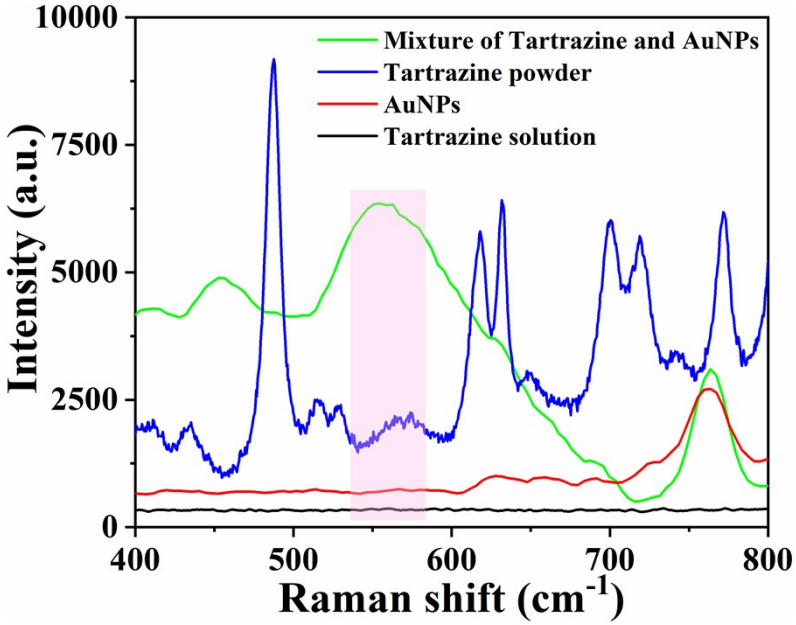

Figure S3. Raman spectra of tartrazine solution (black), AuNPs (red) and tartrazine powder (blue). The SERS spectrum of tartrazine (1.0×10^{-8} M, green).

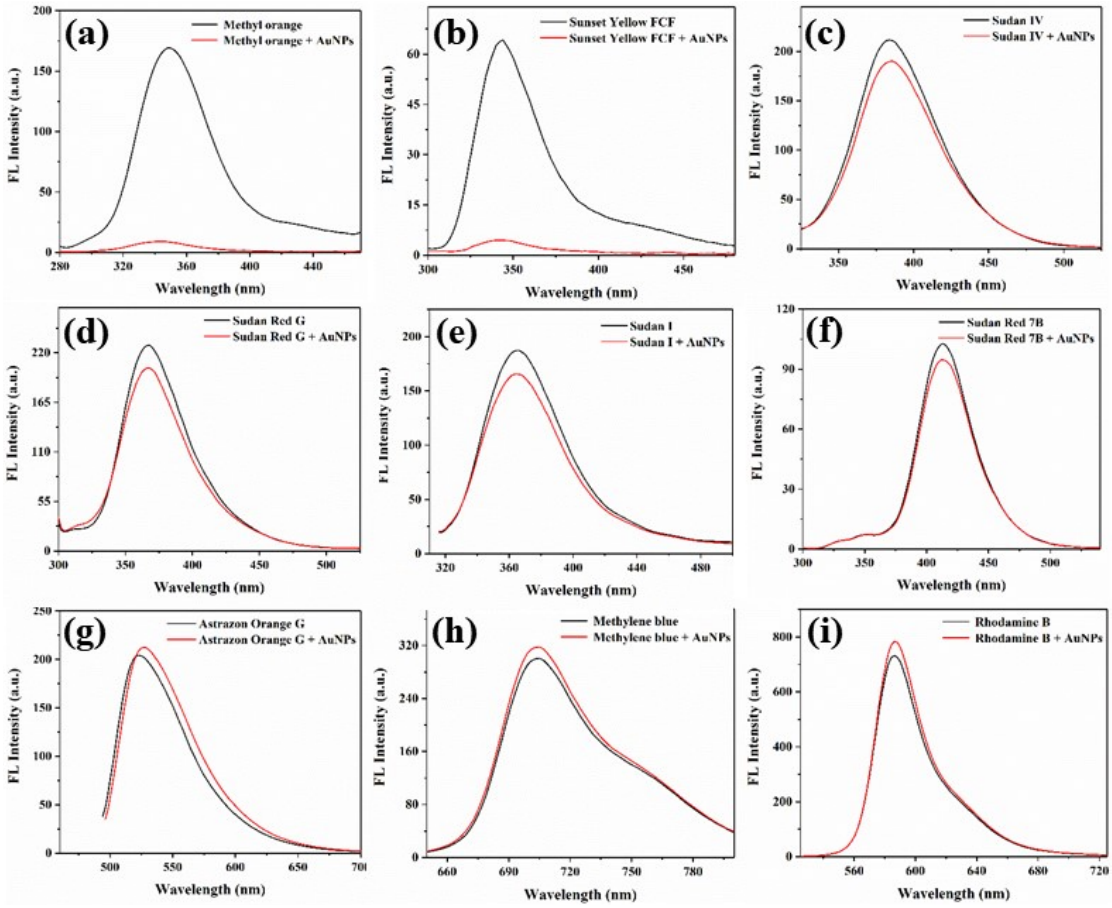

Figure S4. Fluorescence spectra of various compounds solutions with (red) and without (black) AuNPs.

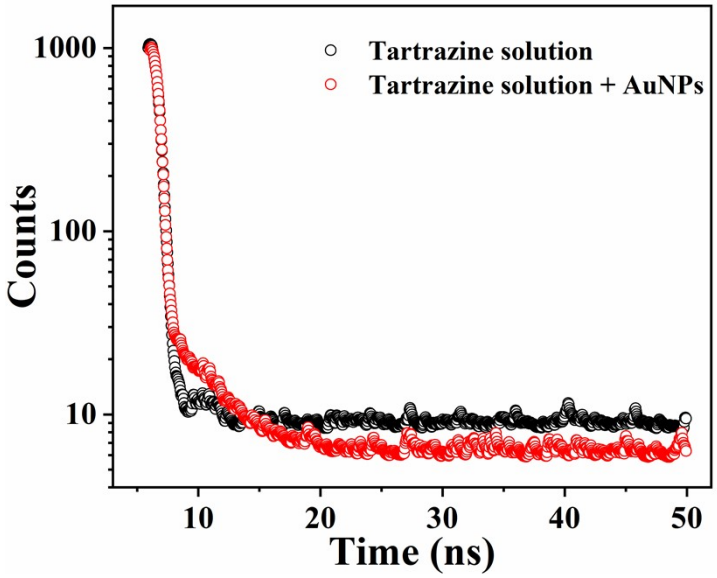

Figure S5. Fluorescence lifetime of tartrazine with (red) and without (black) AuNPs.

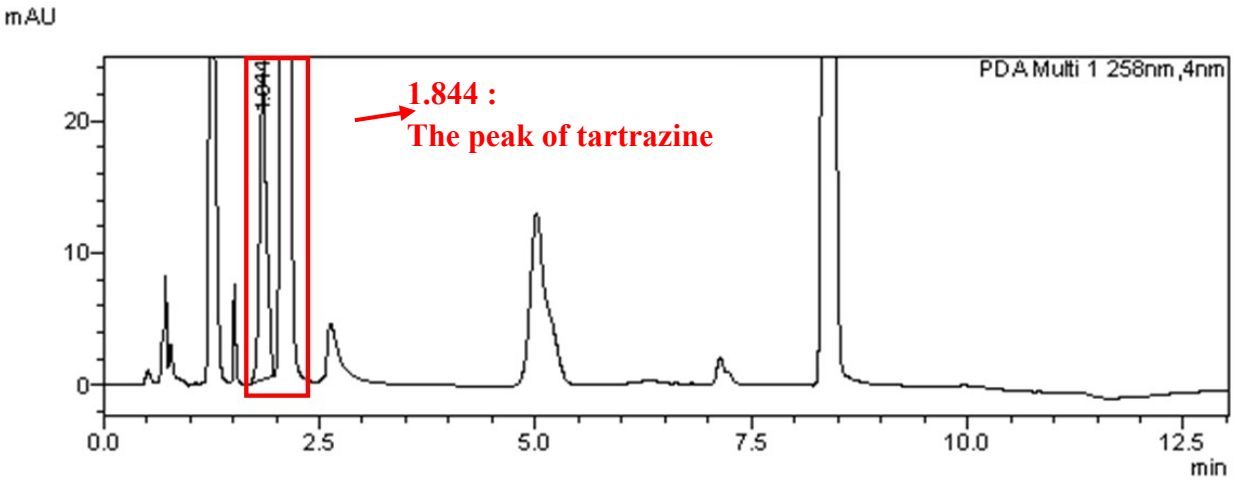

Figure S6. HPLC spectrum of red bull.

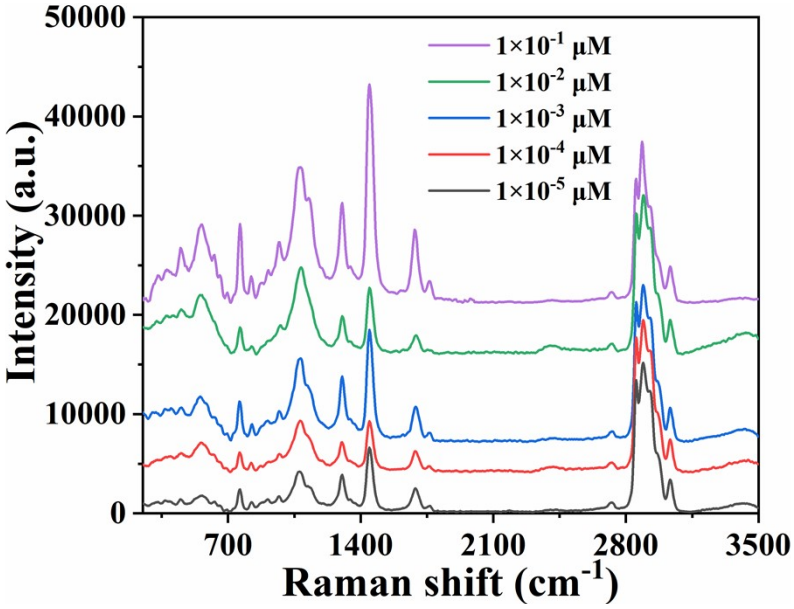

Figure S7. The intact SERS spectra of various concentrations of tartrazine.

Table S1. The RSD of SERS signals for various concentrations of tartrazine.

Concentration of tartrazine (μM)	RSD
1.0×10^{-1}	2.15
1.0×10^{-2}	0.69
1.0×10^{-3}	0.78
1.0×10^{-4}	4.34
1.0×10^{-5}	4.28

Table S2. Comparison of various methods and proposed method.

Probe	Method	Linear range(μM)	LoD (nM)	Reference
deep eutectic solvent	UV-vis	0.47-4.87*	157.197*	[S[1]]
ODT column	RP-HPLC	4.7-75*	78.5987*	[S[2]]
CI/CBPCE	CV/LSV	0.037-1.38*	19	[S[3]]
pMe/GCE	CV	5-500	970	[S[4]]
rGO/NiBTC/SPCEs	DPV	0.075-5.0	50	[S[5]]
silver nanoflowers	SERS	0.01-100	10*	[S[6]]
Ag nanowires	SERS	0.019-18.71*	/	[S[7]]
CDs	Fluorescence	0.1-0.5	26	[S[8]]
BSA-NiNCs	Fluorescence	0.01-3.5	4	[S[9]]
AuNPs	Fluorescence/SERS	2-40/10^{-5}-0.1	15.4/0.0008	This work

* The data were obtained by unit conversion.

Table S3. The quantum yield and fluorescence lifetime for tartrazine with and without AuNPs.

Sample	τ1 (ns)	%	τ2 (ns)	%	τ (ns)
Tartrazine solution	0.15	93.14	2.78	6.86	0.33
Tartrazine solution + AuNPs	0.16	91.58	3.37	9.42	0.43

Table S4. Detection of tartrazine concentration in drinks by Standard additions method (n=3).

Samples	Detected(μM)	Added(μM)	Found(μM)	Recovery(%)	RSD
1	0.0	20.0	22.1	110.9 ± 0.1	0.1
		40.0	37.8	94.7 ± 0.2	0.2
2	0.0	20.0	22.2 ± 0.1	111.6 ± 0.6	0.6
		40.0	37.7	94.5 ± 0.2	0.2
3	0.0	20.0	110.9 ± 0.2	110.9 ± 0.2	0.2
		40.0	37.7	94.4 ± 0.1	0.1

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