A Facile Smartphone-based Digital Image Colorimetric Sensor for the Determination of Tetracyclines in Water using Natural Phenolic Compounds Induced to Growth Gold Nanoparticles

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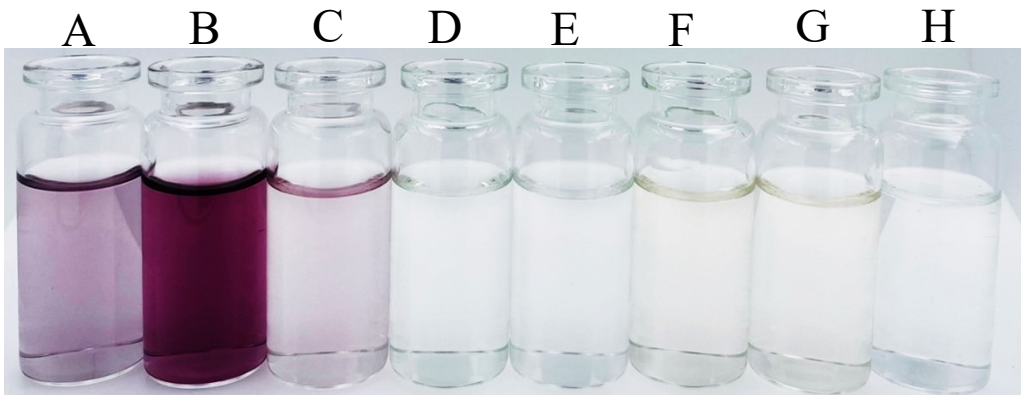


Fig. S1 Different conditions for TC determination, (A) Natural phenolic compound, $AuCl_3$ under NaOH (Blank), (B) Natural phenolic compound, $AuCl_3$, TC under NaOH, (C) $AuCl_3$ and TCs under NaOH, (D) $AuCl_3$ under NaOH, (E) $AuCl_3$ and TCs, (F) Natural phenolic compound and TC under NaOH, (G) TC under NaOH, (H) Natural phenolic compound under NaOH.

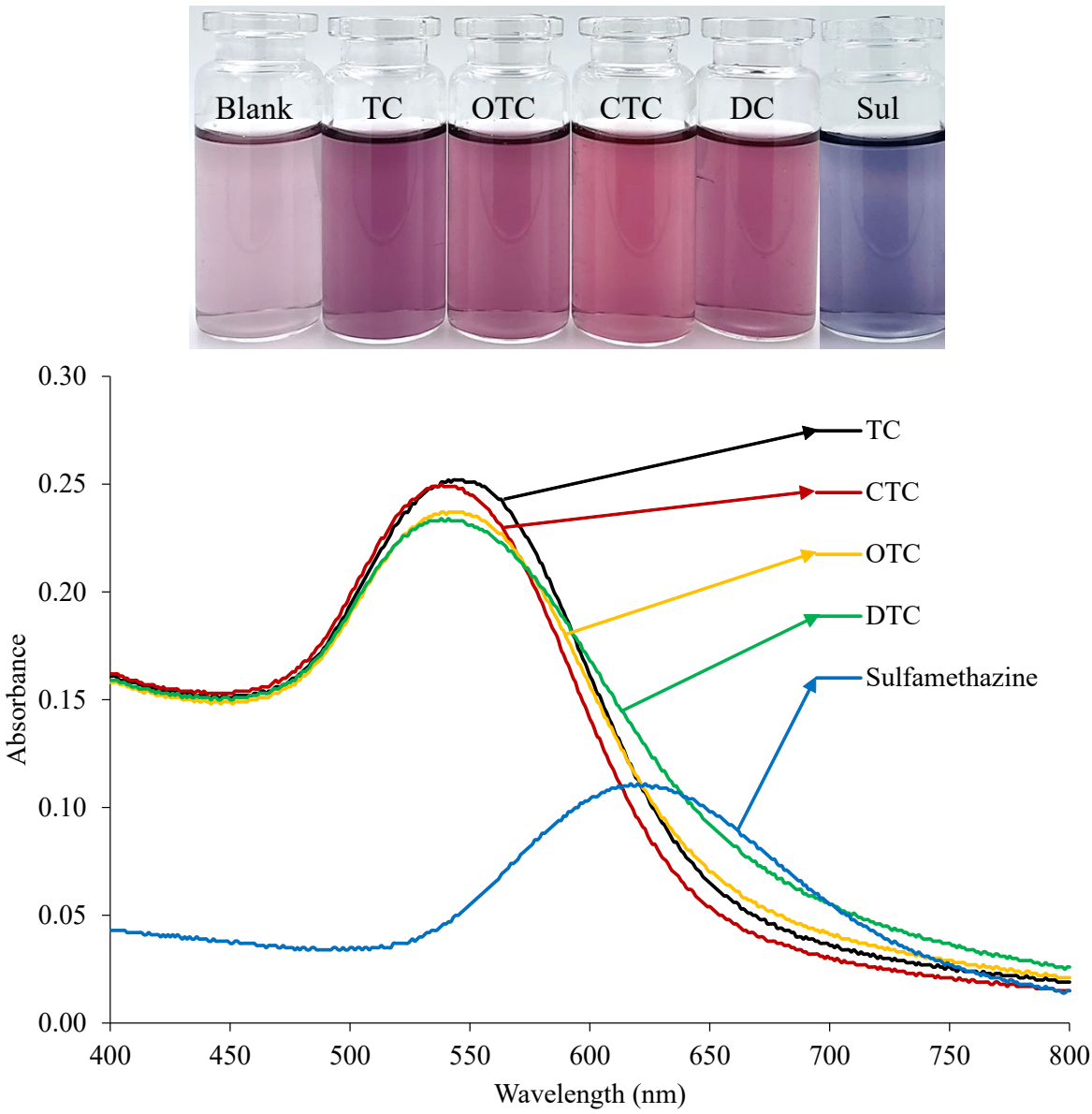


Fig. S2 Photo images of AuNPs induced with natural reagent in the presence of tetracycline (TC), oxytetracycline (OTC), chlortetracycline (CTC), doxycycline (DC), sulfamethazine (Sul), and the surface plasmon resonance (SPR) of AuNPs with different antibiotics.

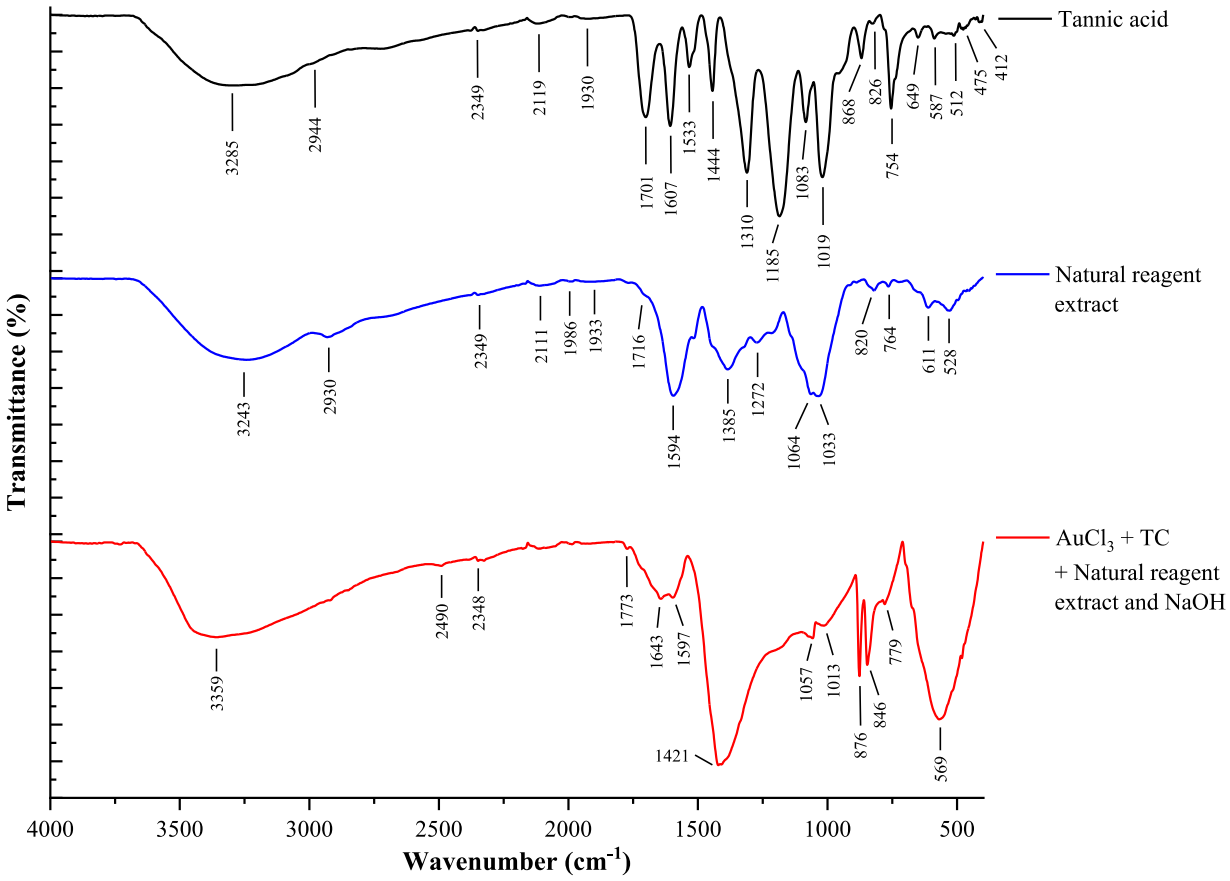


Fig. S3 FTIR spectra of natural reagent extract overlay with standard tannic acid, and $AuCl_3$, natural reagent extract and TC.

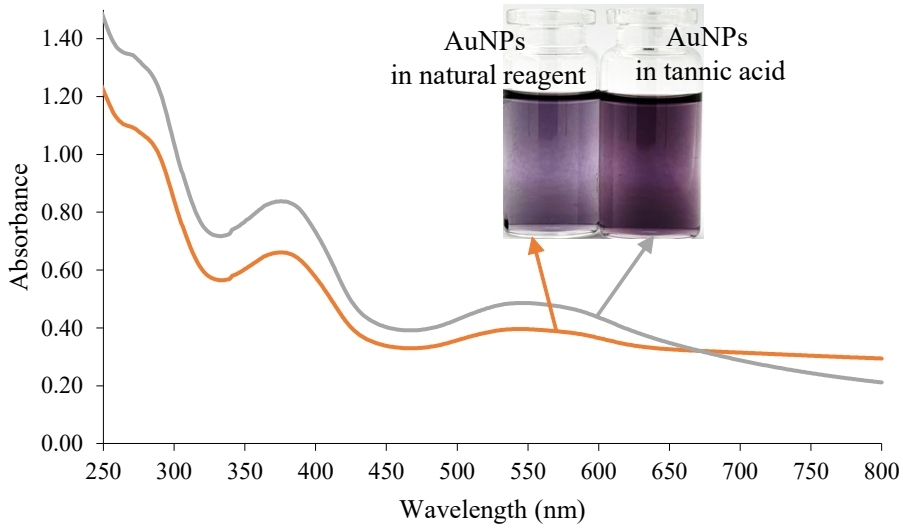


Fig. S4 Surface plasmon resonance of AuNPs in the presence of tetracycline with natural reagent or standard tannic acid.

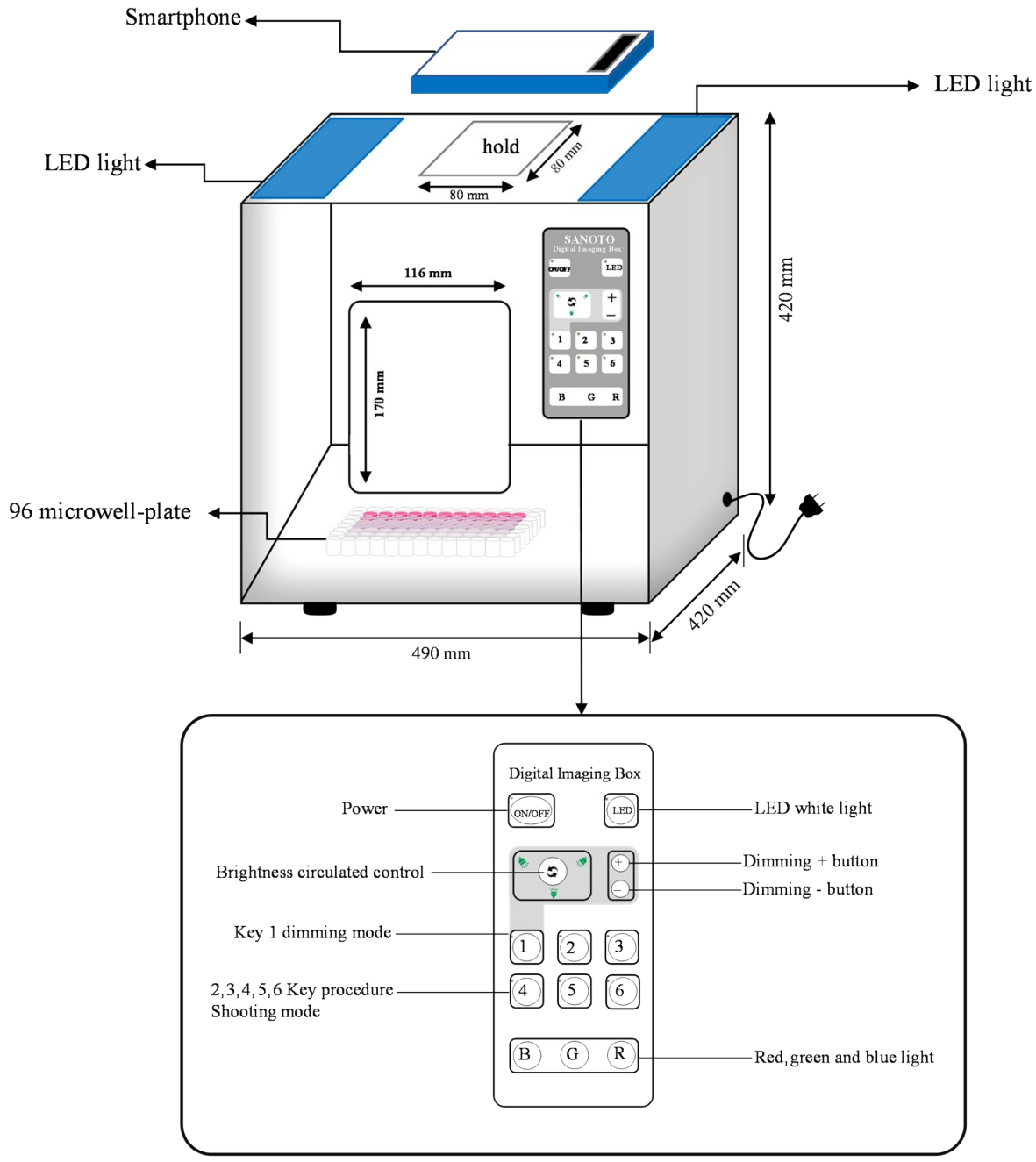


Fig. S5 Light control box cabinet.

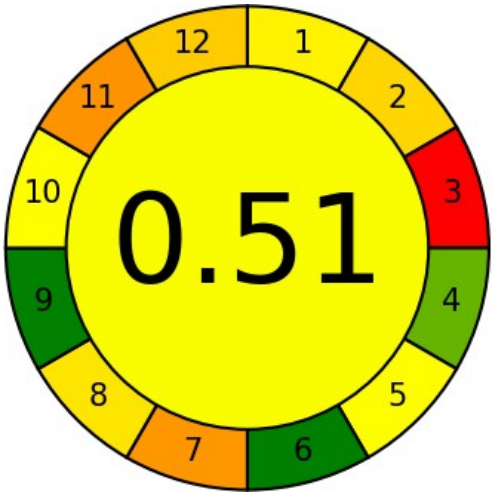
Table S1 Optimal conditions for tetracycline determination using AuNPs capped with natural phenolic extracts

Parameter	**Optimal condition**
Red, Green, and Blue intensity	Green
Detection volume in microplate (μL)	300
Concentration of $AuCl_3$ (mmol L^{-1})	1.0
Volume of natural phenolic extracts (μL)	60
Concentration of NaOH (mmol L^{-1})	1
Incubation temperature (°C)	40
Incubation time (min)	20

Table S2. Penalty points (PPs)

Reagent	Penalty points (PPs)			Instrument	PPs
	Amount PP	Hazard PP	Total PPs (Amount PP× Hazard PP)		
ACN (<10 mL)	1	4	4	Centrifuge	1
$AuCl_3$ (<10 mL)	1	1	1	Heater/stirrer	2
NaOH (<10 mL)	1	2	2	Smartphone-based	0
				Occupational hazard	0
				Vortex	1
				Ultrasonic bath	2
				Waste	5
Subtotal PP	-	-	7		11
Total PPs	-	-	18		
Analytical Eco-Scale score			82		

Analytical Greenness report sheet



1. Sample treatment
2. Sample amount
3. Device positioning
4. Sample prep. stages
5. Automation, miniaturization
6. Derivatization
7. Waste
8. Analysis throughput
9. Energy consumption
10. Source of reagents
11. Toxicity
12. Operator's safety

Criteria	Score	Weight
1. Direct analytical techniques should be applied to avoid sample treatment.	0.48	2
2. Minimal sample size and minimal number of samples are goals.	0.42	2
3. If possible, measurements should be performed in situ.	0.0	2
4. Integration of analytical processes and operations saves energy and reduces the use of reagents.	0.8	2
5. Automated and miniaturized methods should be selected.	0.5	2
6. Derivatization should be avoided.	1.0	2
7. Generation of a large volume of analytical waste should be avoided, and proper management of analytical waste should be provided.	0.3	2
8. Multi-analyte or multi-parameter methods are preferred versus methods using one analyte at a time.	0.45	2
9. The use of energy should be minimized.	1.0	2
10. Reagents obtained from renewable sources should be preferred.	0.5	2
11. Toxic reagents should be eliminated or replaced.	0.29	2
12. Operator's safety should be increased.	0.4	2

Fig. S6 Result of AGREE assessment.