

Supplementary Information

Polyphenolic Condensation Assembly Enabled Biocompatible, Antioxidative, Light Color Tea Sunscreen Formulations with Broadband UV Protection

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Table S1. Abbreviations and compositions of different polyphenol particles.

Sample names	Polyphenol	Aldehyde	Amino acid	Solvent
TPA	TPA51		Arg, 100 mg	
	TPA21		Arg, 250 mg	
	TPA11		Arg, 500 mg	
TPC	TPC51	Tea polyphenol (TP) 500 mg	Cys, 100 mg	
	TPC21		Cys, 250 mg	
	TPC11		Cys, 500 mg	
TPG	TPG51		Gly, 100 mg	
	TPG21		Gly, 250 mg	
	TPG11	Formaldehyde (37%)	Gly, 500 mg	Deionized water
EA	EA51	100 μ L	Arg, 100 mg	100 mL
	EA21		Arg, 250 mg	
	EA11		Arg, 500 mg	
EC	EC51	EGCG (>94%) 500 mg	Cys, 100 mg	
	EC21		Cys, 250 mg	
	EC11		Cys, 500 mg	
EG	EG51		Gly, 100 mg	
	EG21		Gly, 250 mg	
	EG11		Gly, 500 mg	

Table S2. Abbreviations and compositions of different emulsion formulations.

Sample names	Stabilizers	Oil phase
TPA PE	TPA 21, 20 mg/mL, 1 mL	
TPC PE	TPC 21, 20 mg/mL, 1 mL	
TPG PE	TPG 21, 20 mg/mL, 1 mL	Flaxseed oil, 1 mL
EA PE	EA 21, 20 mg/mL, 1 mL	
EC PE	EC 21, 20 mg/mL, 1 mL	
EG PE	EG 21, 20 mg/mL, 1 mL	

Table S3. Abbreviations and compositions of different optimized emulsion formulations.

Sample names	Stabilizers	Oil phase	PEG
0.5% PE	EG 21, 10 mg/mL,1 mL		
1% PE	EG 21, 20 mg/mL,1 mL	Flaxseed oil,1 mL	10 mg/mL, 10 μ L
2.5% PE	EG 21, 50 mg/mL,1 mL		
5% PE	EG 21, 100 mg/mL,1 mL		

Table S4. Element analysis of typical polyphenol nanoparticles.

Sample name	Elemental analysis				Mass fraction of amino acid	
	N (%)	S (%)	C (%)	H (%)	Theoretical value (%)	Detection value (%)
EG 21	2.83	0.01	51.44	5.27	13.77	15.16
EC21	1.69	2.80	53.51	5.19	11.58	14.61

Table S5. Mass spectrum analysis of EG21 NPs.

Main products	Mass spectrum analysis	
	Peak area (S)	Ratio (%)
I and II	25	7.9
III	79	25.0
IV	19	6.1
V	5	1.5

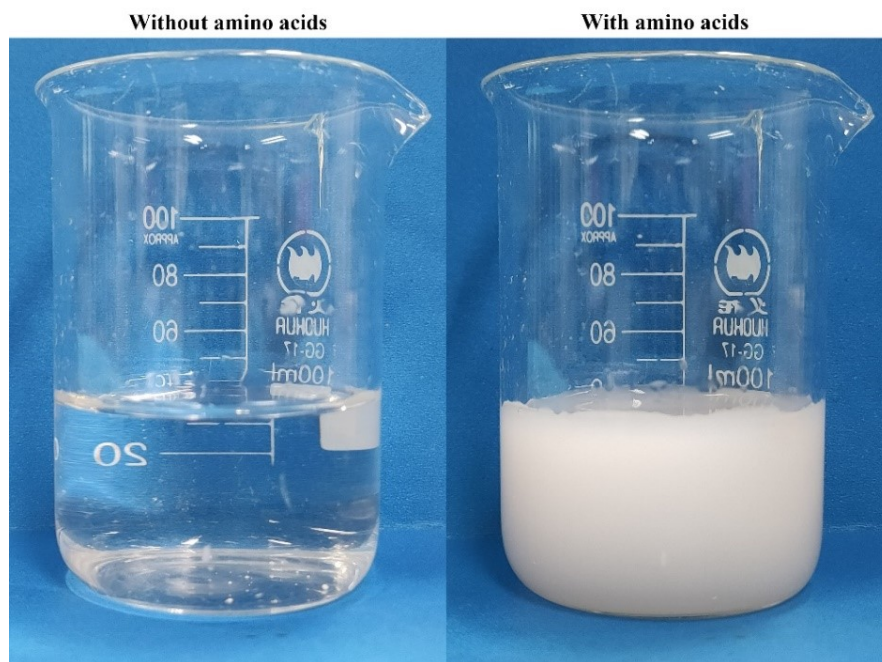


Figure S1. Digital photos of the reaction solution without (left) or with (right) amino acids.

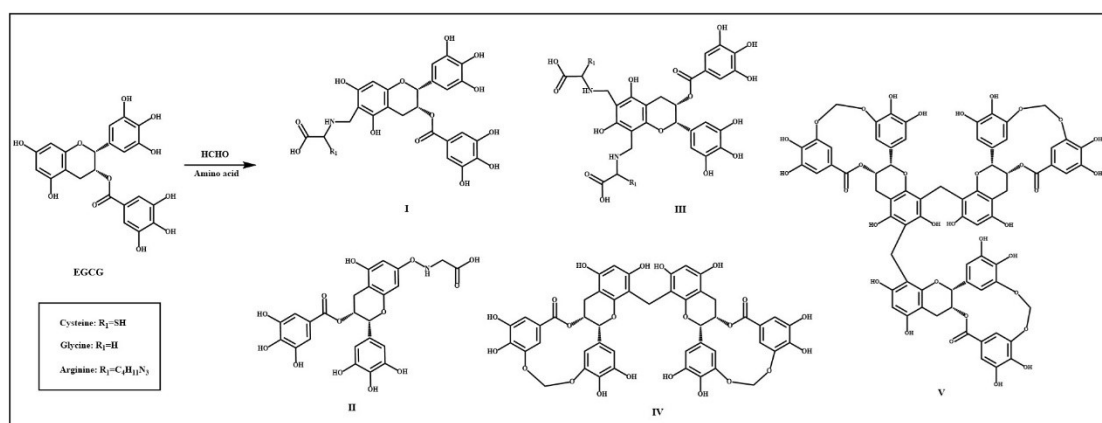


Figure S2. Proposed reaction and structures for the condensation products of EGCG and amino acids.

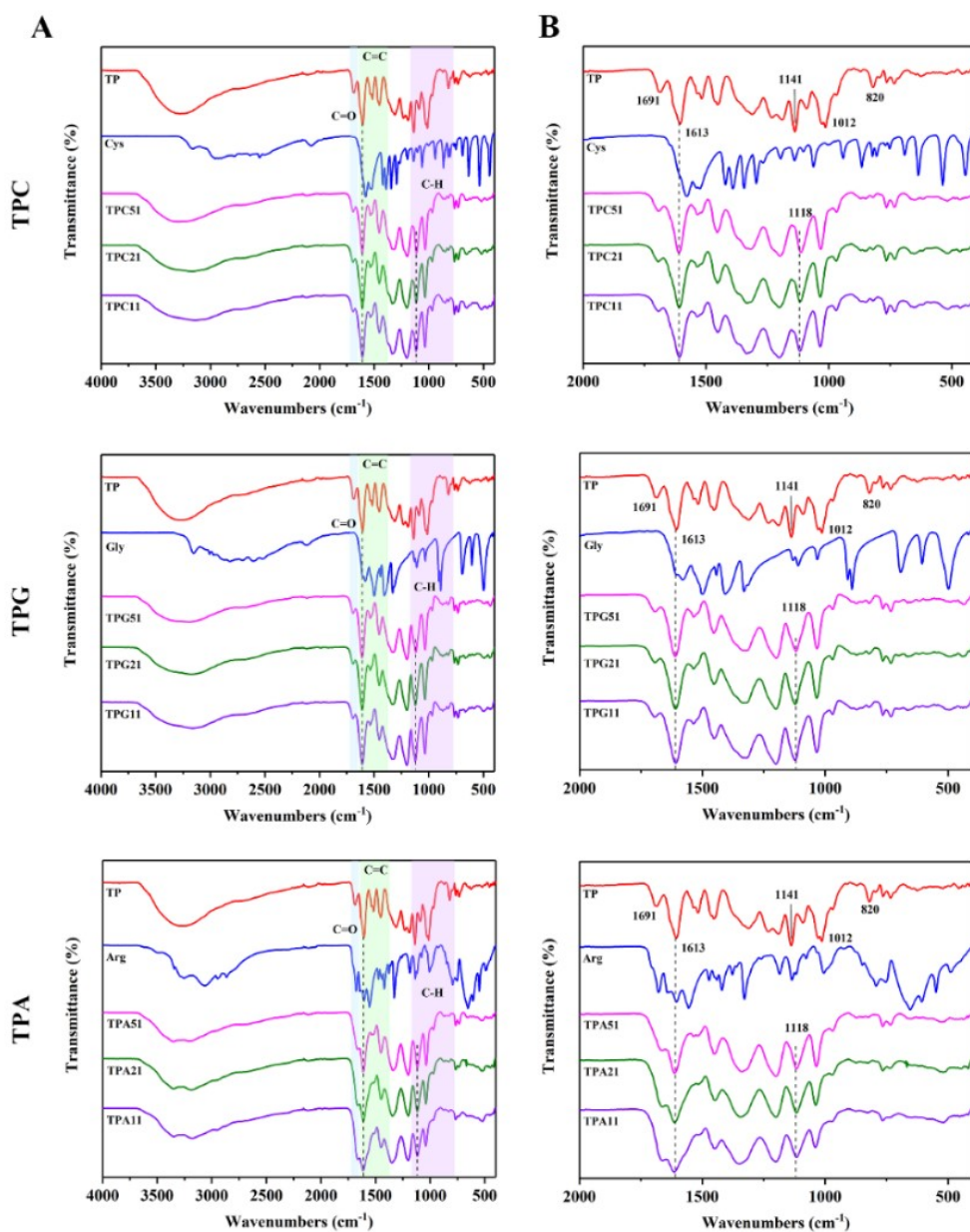


Figure S3. (A) Fourier transform infrared spectroscopy (FTIR) and (B) corresponding magnified images of different TP particles.

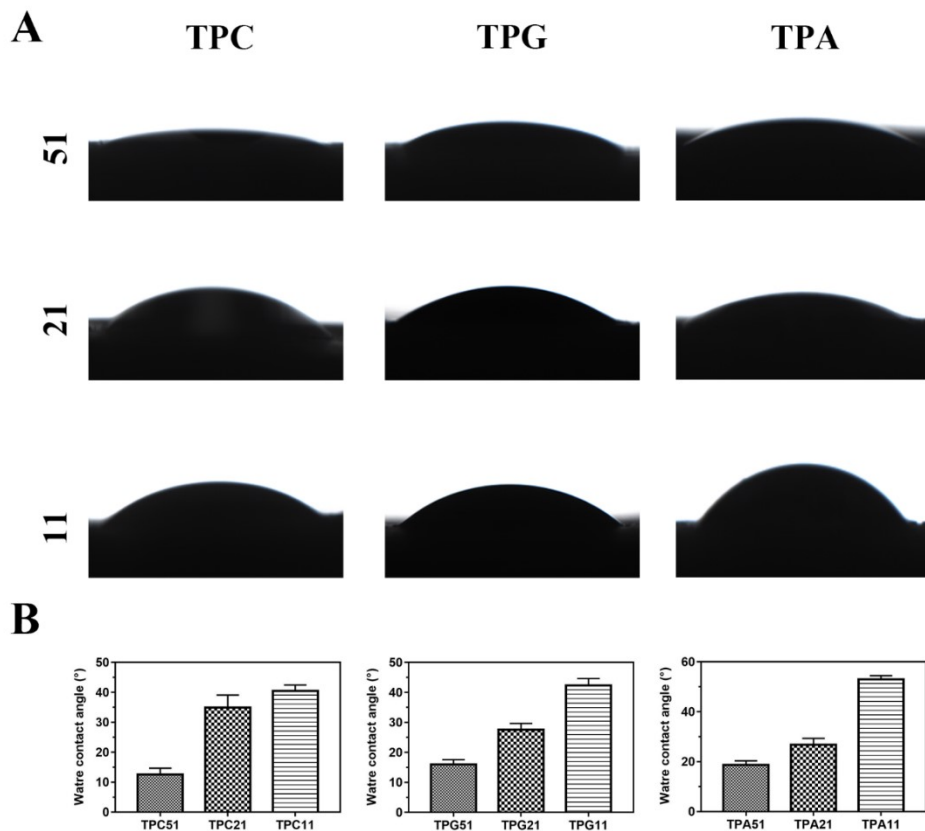


Figure S4. (A) Digital photos for wettability and (B) the water contact angle value of different TP particles.

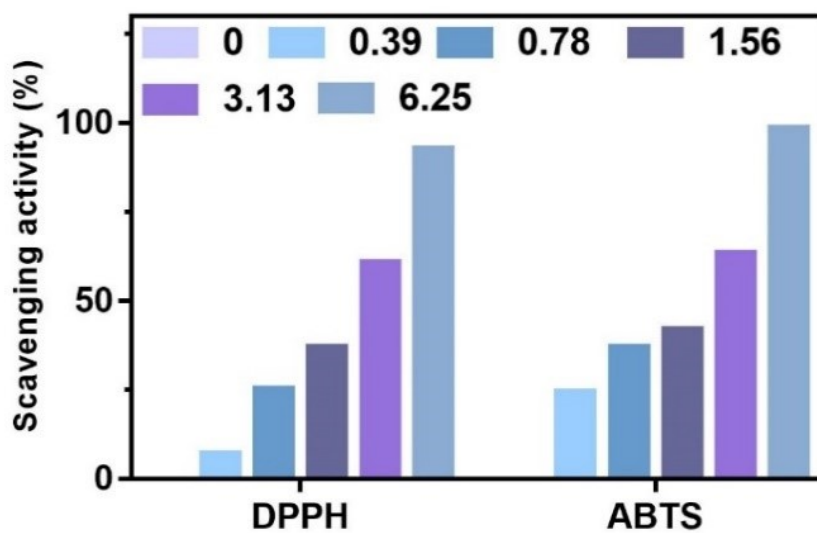


Figure S5. Free radical scavenging activity of EG21 NPs.

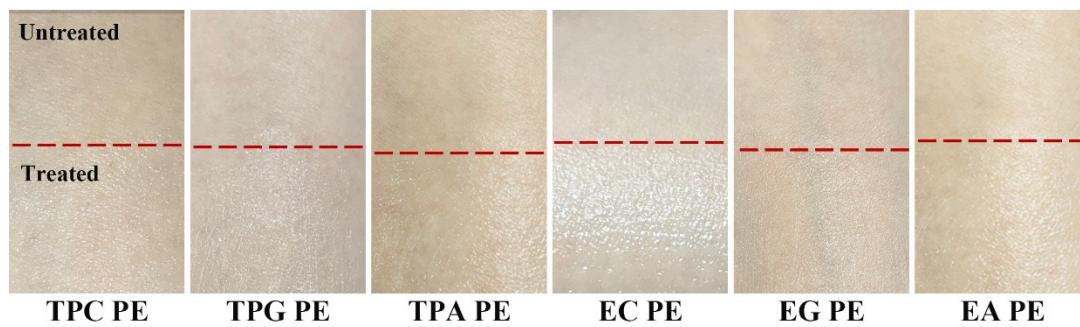


Figure S6. Appearance of polyphenol particles-stabilized emulsion formulations evenly spread on the skin.

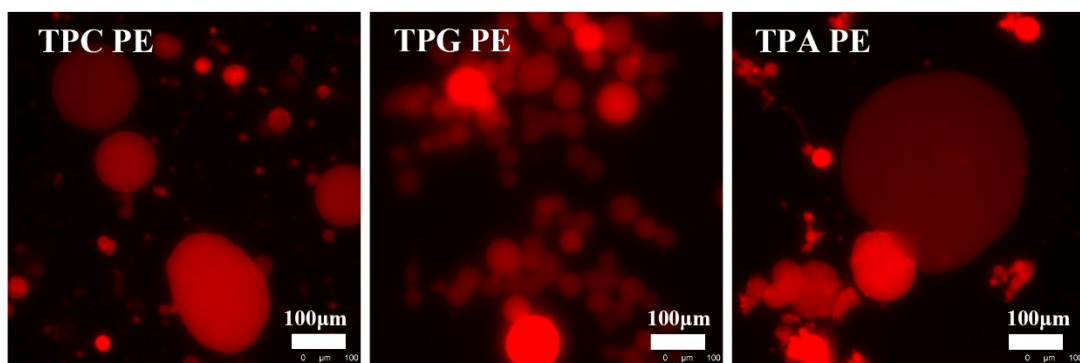


Figure S7. Fluorescence microscope images of the droplets of emulsion formulations stabilized with 2:1 TP particles.