RSC Advances

SUPPLEMENTARY INFORMATION

SINGLE-STEP CONTROLLED SYNTHESIS OF FLOWER-LIKE GOLD NANOPARTICLES STABILIZED BY CHITOSAN FOR SENSITIVE DETECTION OF HEPARIN USING SURFACE ENHANCED RAMAN SCATTERING METHOD

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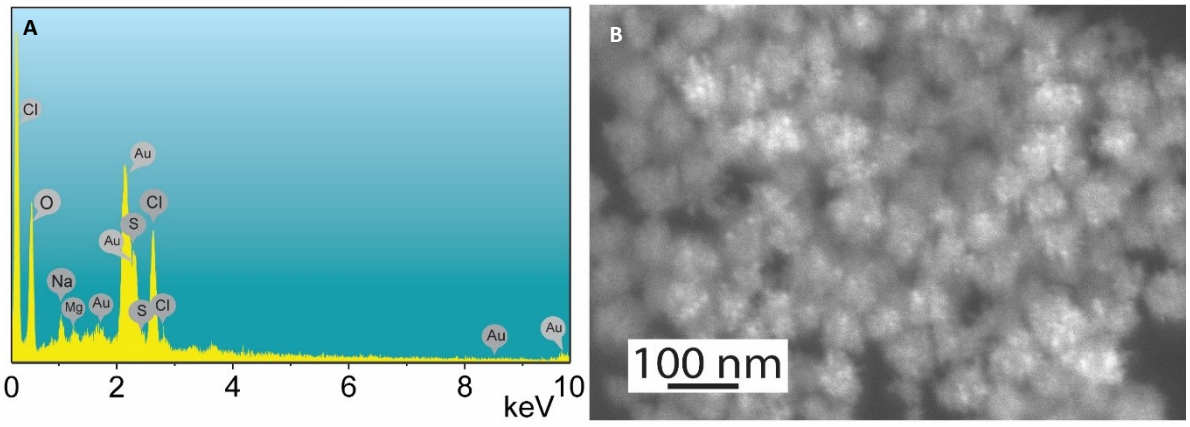

Fig. S1 (A) EDS spectroscopy and (B) corresponding SEM images of formed AuNFs-4-MBA@chitosan (scale bar 100 nm).

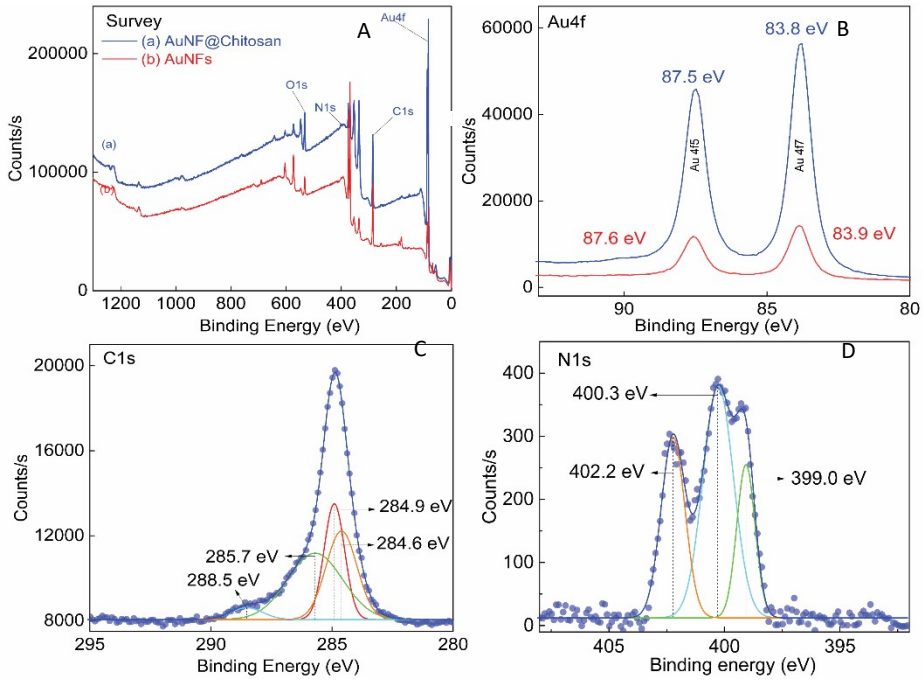

Fig S2. (A) XPS survey spectra of the AuNFs stabilized with chitosan, high-resolution XPS spectra of (B) Au4f, (C) C1s, and (D) N1s.

Table S1. FTIR band positions of AuNFs-chitosan, pure chitosan, pure heparin, and AuNF-chitosan-heparin.

Wavenumber (cm^{-1})				Assignment	Ref
AuNFs-4-MBA@CS	Pure CS	Pure HEP	AuNFs-4-MBA@CS after adding HEP		
3523	3447			O-H overlapped with N-H stretch	1, 2
3311					
2916	2921			C-H stretch	1, 3
1753	1700			Amide II stretch	
1628	1657			C=O stretching in amide I acetyl amino in heparin	1, 3
		1620	1621		4
	1539		1539	N-H stretch (amide II)	1, 2, 5
1392	1409			Asymmetric C-H stretch bending of CH_2 group	1
	1369			Amide III	
	1319	1313		C-O stretch, S=O	6
		1233	1233	N-sulphonate	7-9
1112				C-H symmetrical bending	10
1018	1066			Skeletal vibration C-O bridge (glucosamine)	1, 10
869		890		OH in-plane bending	10
				Coupling of C-O-S and ring C-O-C	11

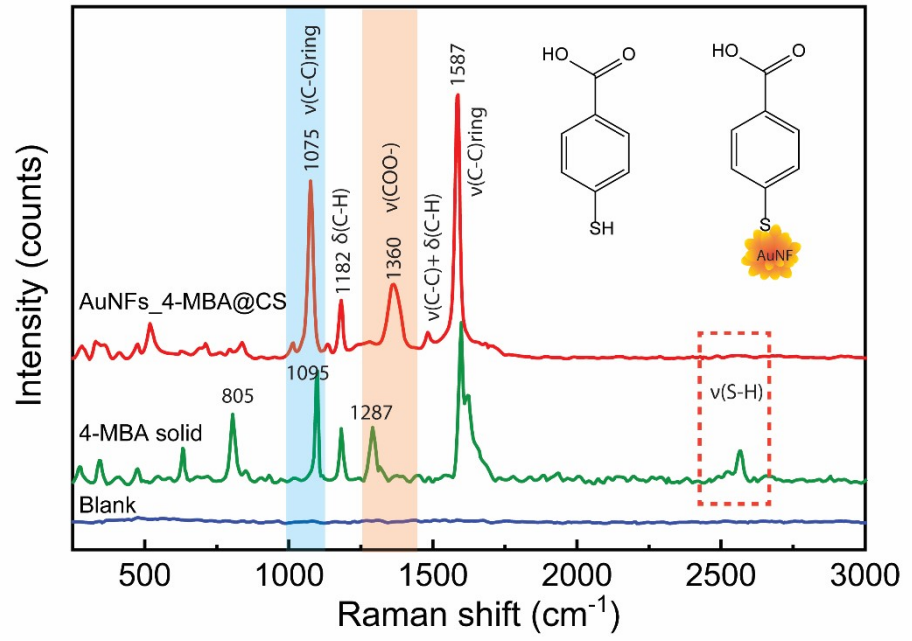

Fig S3. Compared SERS spectroscopy of (A) 4-MBA solid and (B) AuNFs-MBA@CS after adding chitosan.

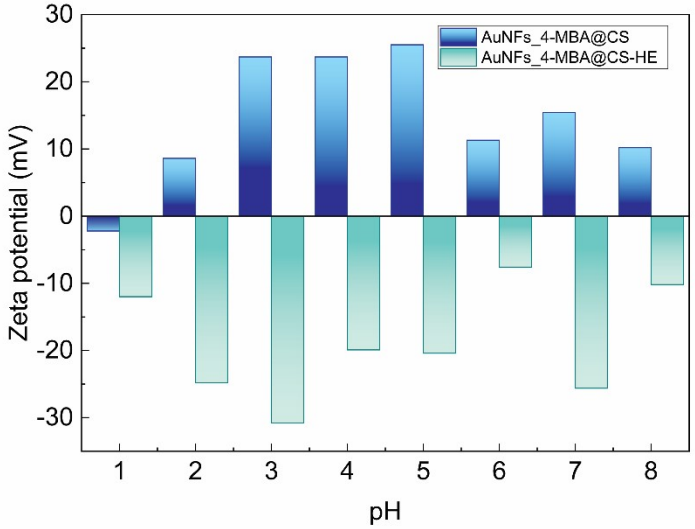

Fig S4. Zeta potential of AuNFs-chitosan (blue column), and AuNFs-4-MBA@chitosan-heparin (green-column).

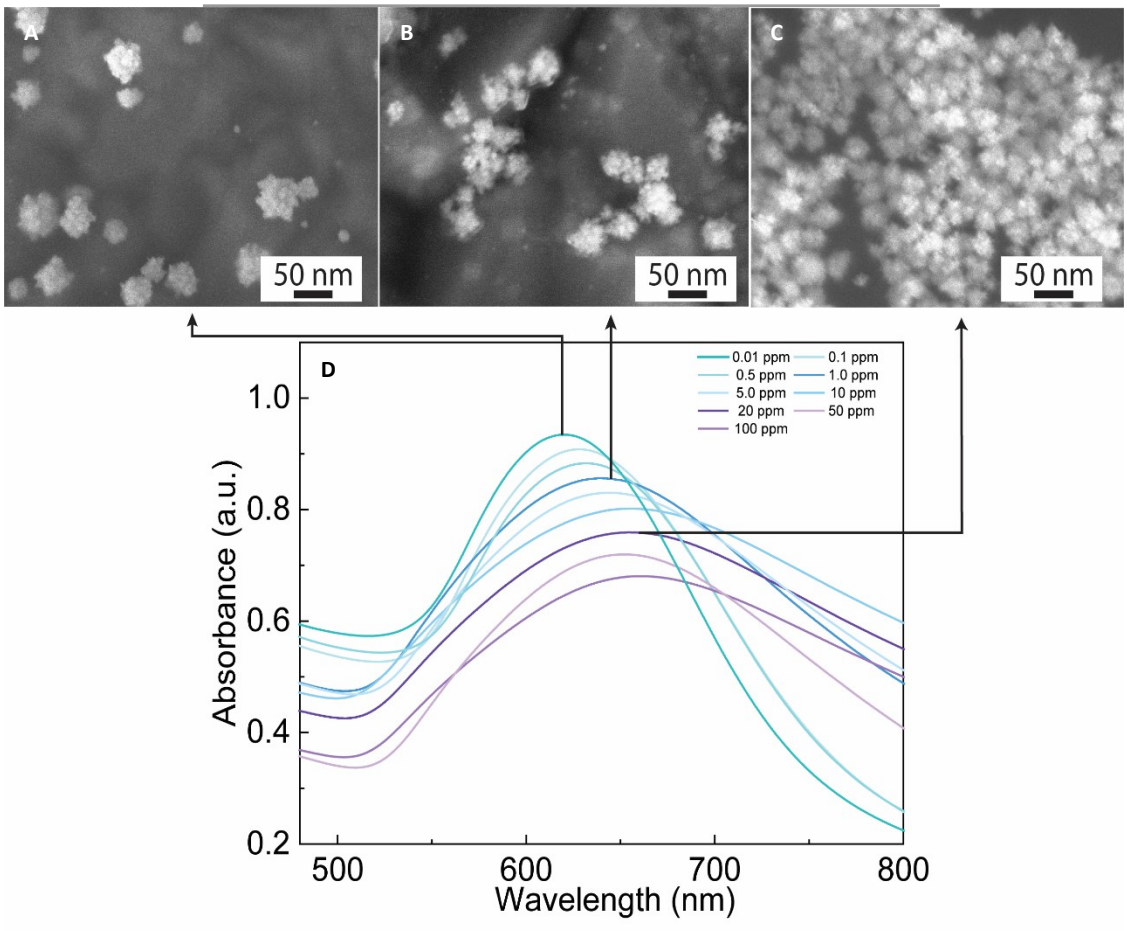

Fig S5. (A), (B), (C) SEM images of colloidal SERS tags after adding 0.01, 1.0, and 20 ppm concentration of heparin, and (D) UV-Vis spectrum of AuNFs-4-MBA@Chitosan colloids added with different heparin concentrations ranging from 0.01 to 100 ppm

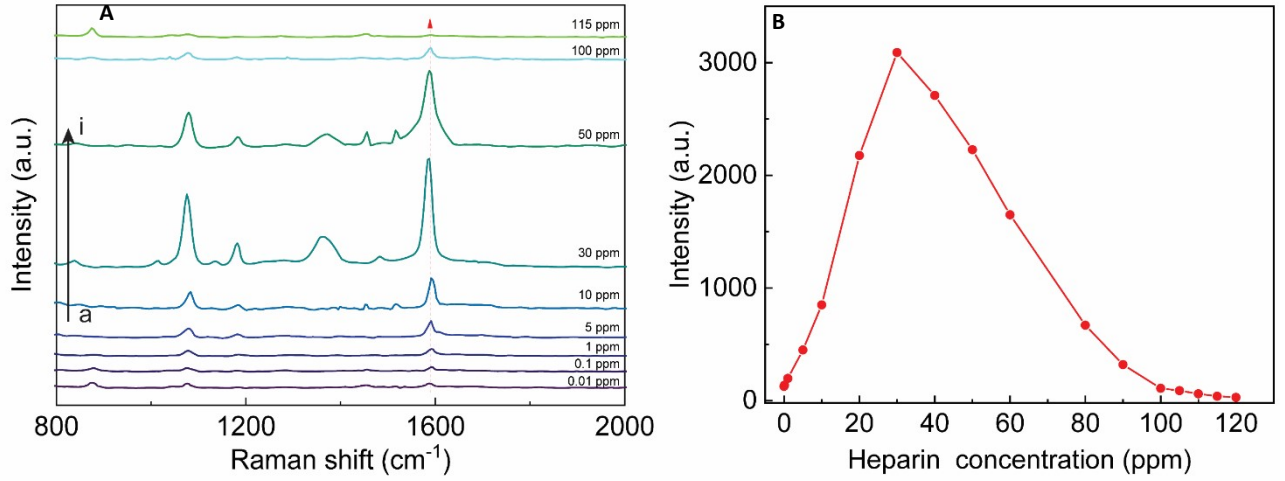

Fig S6. (A) SERS spectra of AuNFs-4-MBA@CS colloidal solution studied with different heparin concentrations (a-i: 0.01, 0.1, 1.0, 5.0, 10, 30, 50, 100, and 115 ppm); (B) Intensity change of Raman peak at 1587 cm^{-1+} while changing the heparin concentration.

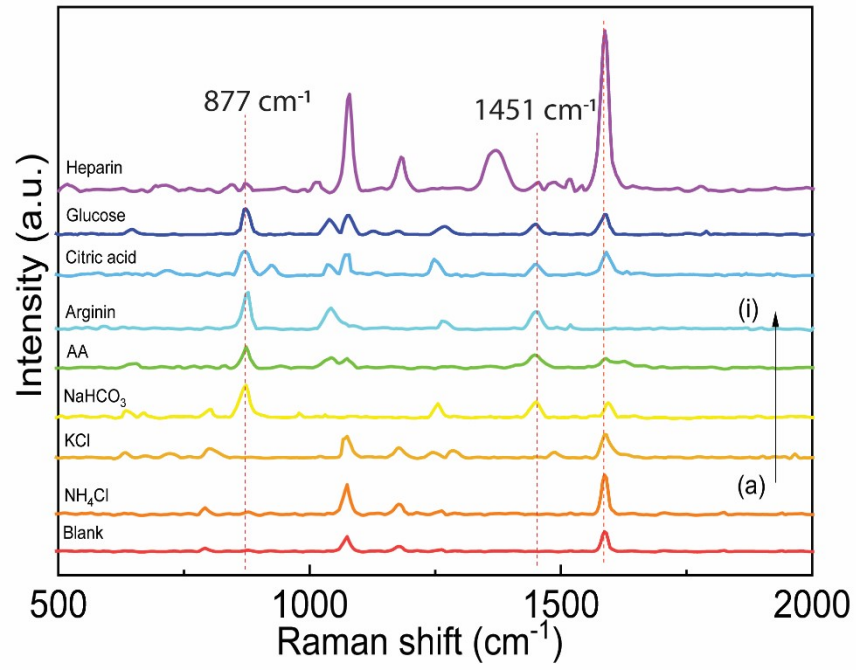

Figure S7. Compared SERS spectra of AuNFs-4-MBA@CS colloids after adding various substances (a-i: glucose, citric acid, arginine, ascorbic acid, $NaHCO_3$, KCl, NH_4Cl, and heparin) for studying the selectivity. The blank sample was investigated on the AuNFs-4-MBA@chitosan colloid without using any induced-aggregation substance.

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