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Supporting Information

For

A battle between spherical and cube-shaped Ag/AgCl nanoparticle modified imprinted polymer to achieve femtogram detection of alpha-feto protein

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S1: Optimization of amount of CTAB

The amount of CTAB is very important during the synthesis of shape-specific Ag/AgCl nanoparticle, therefore the amount of optimized in this work. Based on different amount of CTAB, different shapes were observed which shows variable currents for ferrocynide, while coated on the surface of PGE. As shown in the Table S1, when the non-specific shapes of Ag/AgCl nanoparticle were used to modify the PGE surface, very less current were observed, which further get increased with increase in shape-specificity of nanoparticle. The maximum current was observed for cube-shaped Ag/AgCl nanoparticle.

Table S1: Optimization of CTAB amount during the synthesis of shape-specific Ag/AgCl nanoparticle.

S.	Amount of CTAB	Shape of nanoparticle	Distribution	Current for
N.	(mg)			ferrocynide (µA)
1.	80.0	No specific shape	-	240
2.	70.0	Mixture of several shapes	Heterogeneous	375
3.	60.0	Cube-shape	Homogeneous	533
4.	50.0	Mixture of several shapes	Heterogeneous	360
5.	40.0	Mixture of several shapes	Heterogeneous	350
6.	30.0	Spherical-shape	Homogeneous	305
7.	20.0	No specific shape	-	250



Figure S1: TEM image of nanoparticles synthesized using 50.0 mg of CTAB.



Figure S2: EDAX spectra of cube-shaped Ag/AgCl nanoparticle.



Figure S3: XPS survey spectra of cube-shaped Ag/AgCl nanoparticle.

Electrode	CV current for ferricyanide	A (cm ²)	Roughness factor	
fabricated	(µA)		(R _f)	
Bare electrode	194	0.17	2.18	
Spherical	305	0.27	3.45	
nanoparticle				
Cubic nanoparticle	533	0.48	6.04	
MIP-cube	512	0.46	5.83	
NIP-cube	419	0.38	4.72	

Table S2: Comparative study on differentially designed PGE.



Figure S4: (A) SWSV run of ferrocynide on bare, spherical and cube-shaped nanoparticle modified PGEs; Optimization of binding parameters: (B) pH of solution, (C) contact time and (D) MIP-dose.

S.N.	Polymer	Surface area (m ² /g)
1.	MIP-cube	56.049
2.	MIP-sphere	33.982
3.	NIP-cube	18.667
4.	NIP-sphere	12.433

Table S3: BET surface area of prepared polymers.

Table S4: Different parameters (viz., Water contact angle measurement data and coating thickness) study of polymer modified electrodes.

S. N.	Type of Electrode	Average degrees \pm SD ^a	Coating thickness (nm)
1.	MIP-cube modified PGE	58.93 ± 1.1	8.50
2.	NIP-cube modified PGE	58.12 ± 1.0	8.62

^aStandard deviations (SD) were calculated using three replicates for each measurement.



Figure S5: FT-IR spectra of (A) adduct polymer, (B) AFP-imprinted polymer and (C) non-imprinted polymer@cube nanoparticle.



Figure S6: Adsorption isotherms: (A) Langmuir and (B) Frendluich. Kinetics study: (C) 1st order and (D) 2nd order.

Isotherm Model	Parameters	Values
Langmuir	$Q_m(pg mg^{-1})$	430.4
	$K_L (mL pg^{-1})$	0.0185
	R ²	0.98
Freundlich	n	0.86
	K_{f} (mL pg ⁻¹)	7.76
	\mathbb{R}^2	0.97
Kinetic Model	Parameters	Values
Pseudo First-order	Q _e (Experimental) (pg mg ⁻¹)	116
	Qe (Calculated) (pg mg ⁻¹)	78
	K_1 (min ⁻¹)	0.25
	\mathbb{R}^2	0.98
Pseudo second order	Q _e (Experimental) (pg mg ⁻¹)	116
	Qe (Calculated) (pg mg ⁻¹)	111
	$K_2 (mg pg^{-1} min^{-1})$	1.2×10^8
	R ²	0.99

Table S5: Parameters of the Langmuir and Freundlich isotherms models and kinetic models for the adsorption of AFP on the MIP-cube fitted to the experimental data.



Figure S7: Optimization of electrochemical parameters: (A) Deposition time and (B) Deposition potential. (C) CV current vs scan rate linear plot for AFP (300.0 pg mL⁻¹). (D) Calibration plot of AFP in the concertation range of 0.10 -700.0 pg mL⁻¹.

Added	Intra-day			In	ter-day	
(pg mL ⁻¹)	^a Found (pg mL ⁻¹)	^b Precision	^c Accuracy	Found (pg mL ⁻¹)	Precision	Accuracy
1.0	0.99 ± 0.001	0.10	-1	1.02 ± 0.002	0.19	2
10.0	10.01 ± 0.012	0.12	0.1	9.99 ± 0.015	0.15	-0.1
20.0	20.02 ± 0.013	0.06	0.1	20.0 ± 0.005	0.02	0
40.0	39.98 ± 0.015	0.04	-0.05	40.04 ± 0.014	0.03	0.1

Table S6: Intra-day and inter-day precision and accuracy results of AFP (n = 6).

^aMean ± standard deviation; ^bPrecision: in terms of relative standard deviation (RSD, %); ^cAccuracy (%): [(found-added)/added]×100.



Figure S8: Adsorption capacity of MIP-cube and MIP-spherical, after storage for 90 days at room temperature.