Online Supporting Information

Fabricating Highly Stable Platinum Organosol over DNA-Scaffolds for Enriched Catalytic and SERS applications

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This SI file contains pages from S1 to S17, which contains the Fig. of XRD pattern, EDS analysis, the time-dependent UV-Vis absorption study, the corresponding kinetics analysis plot, SERS spectrum by using Pt@DNA (0.06 M) and comparison tables related to catalysis and SERS study.

Number of Pages in SI: 17

Number of Figures in SI: 08

Number of Tables in SI: 07

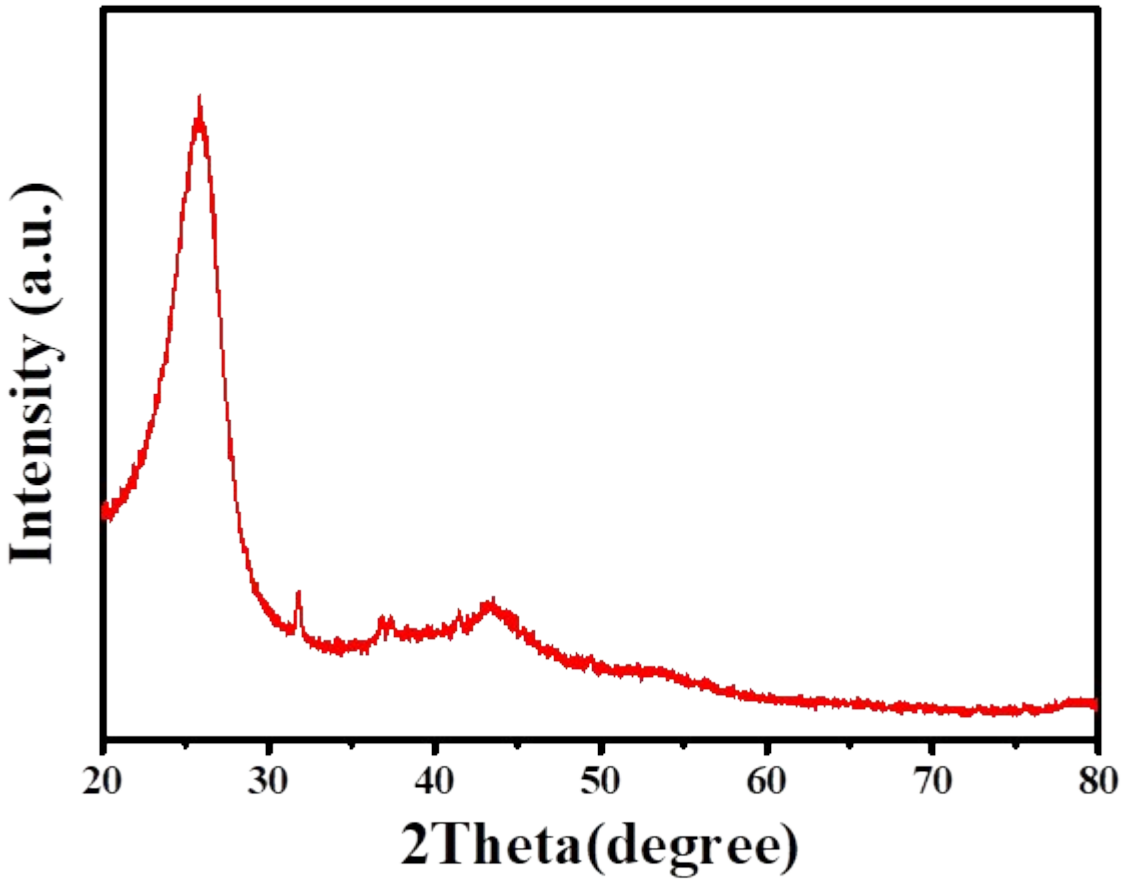

Figure S1: X-ray diffraction pattern of the Pt@DNA (0.06 M) organosol.

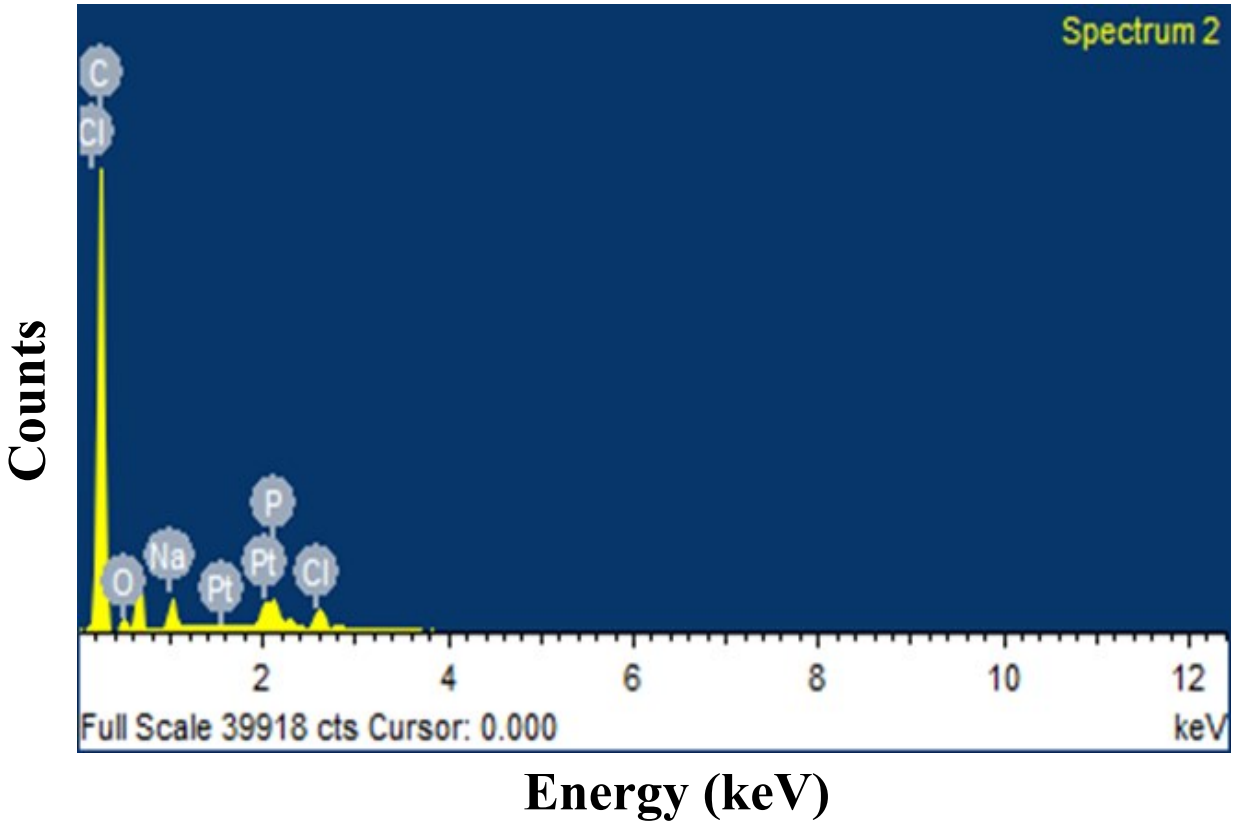

Figure S2: Energy dispersive X-ray spectrum (EDS) of Pt@DNA organosol in FE-SEM mode.

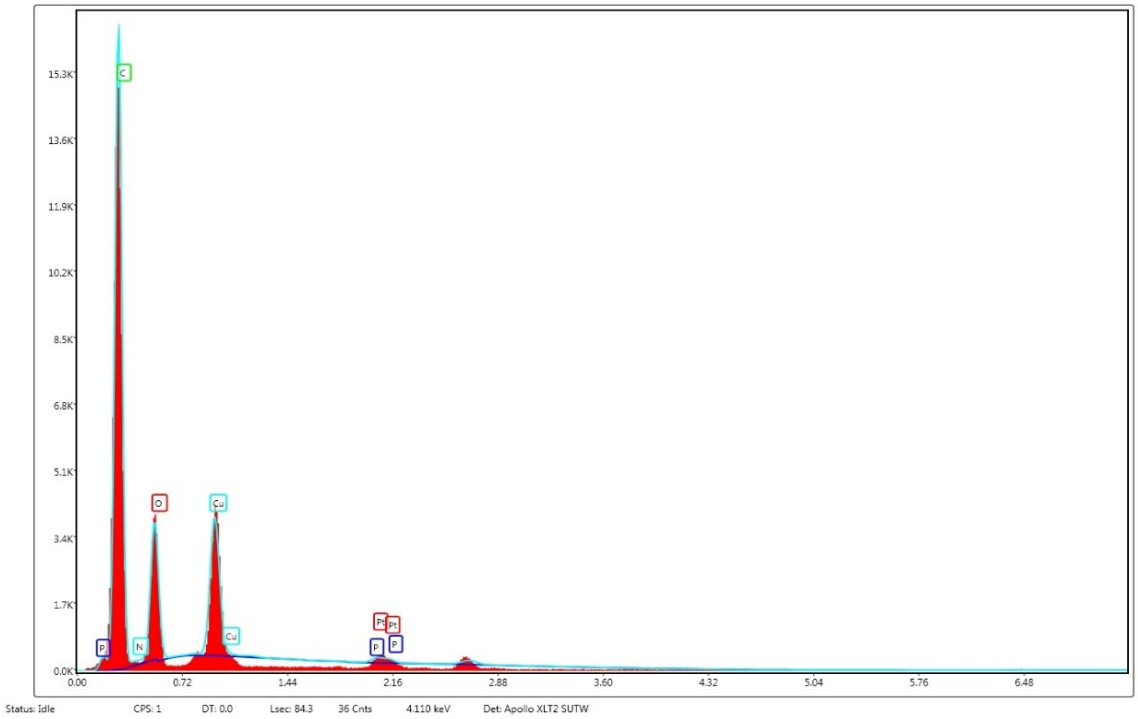

Figure S3: EDAX analysis pattern of the Pt@DNA (0.06 M) organosol at HR-TEM mode.

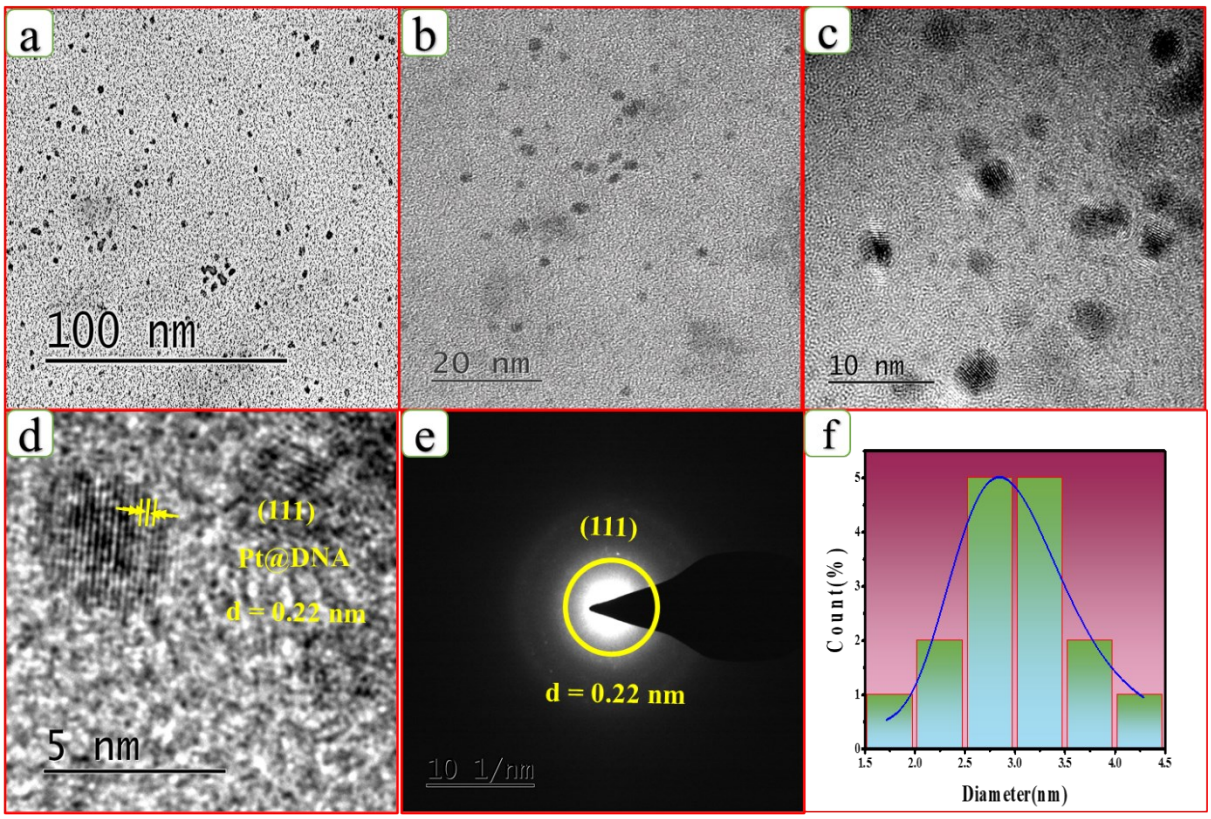

Figure S4: (a-d) shows the low and high magnified HR-TEM images of Pt@DNA (0.05 M) organosol; (e and f) represents corresponding SAED pattern and particle size distribution histogram of the same.

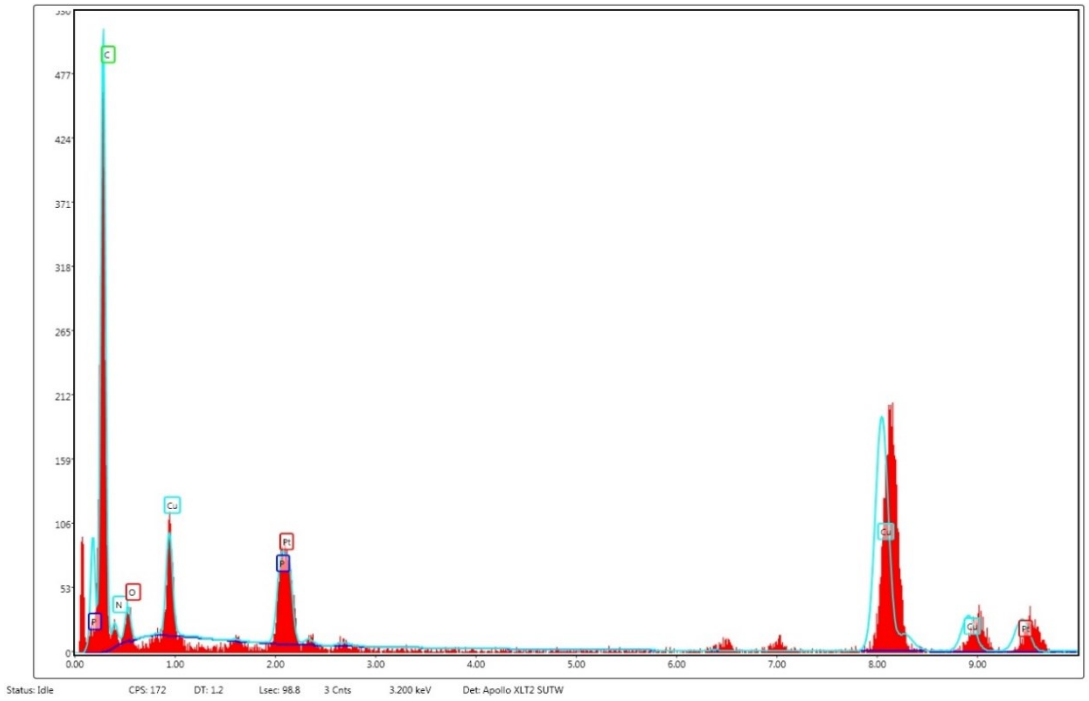

Figure S5. EDAX analysis pattern of the Pt@DNA (0.05 M) organosol at HR-TEM mode.

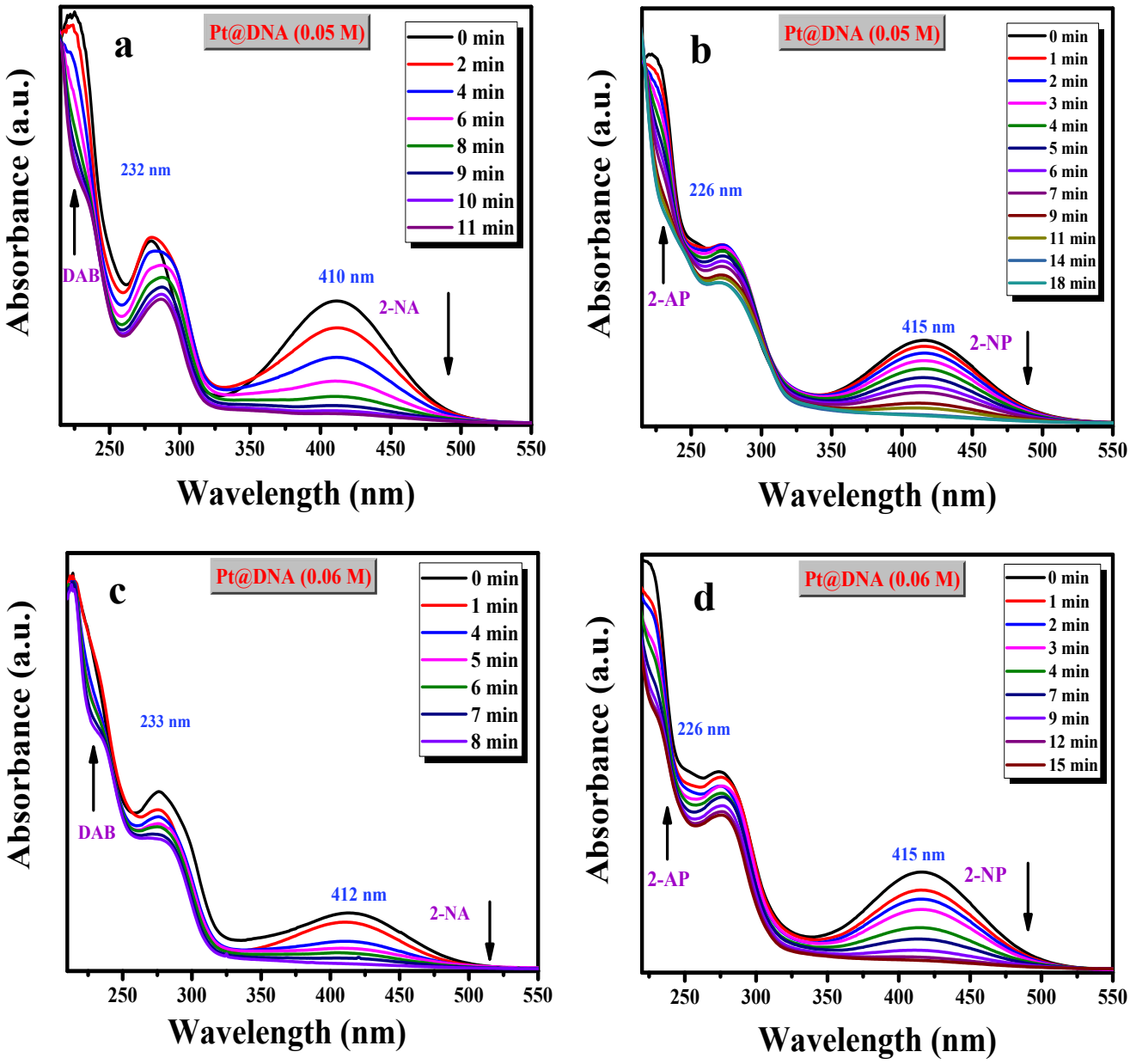

Figure S6: Time dependent UV-Vis absorption spectrum of catalytic reduction of nitro compounds into amine compounds, (a and b) shows the catalytic reduction of 2-NA using Pt@DNA (0.05 M) and Pt@DNA (0.06 M), (c and d) represents the catalytic reduction of 2-NP using Pt@DNA (0.05 M) and Pt@DNA (0.06 M).

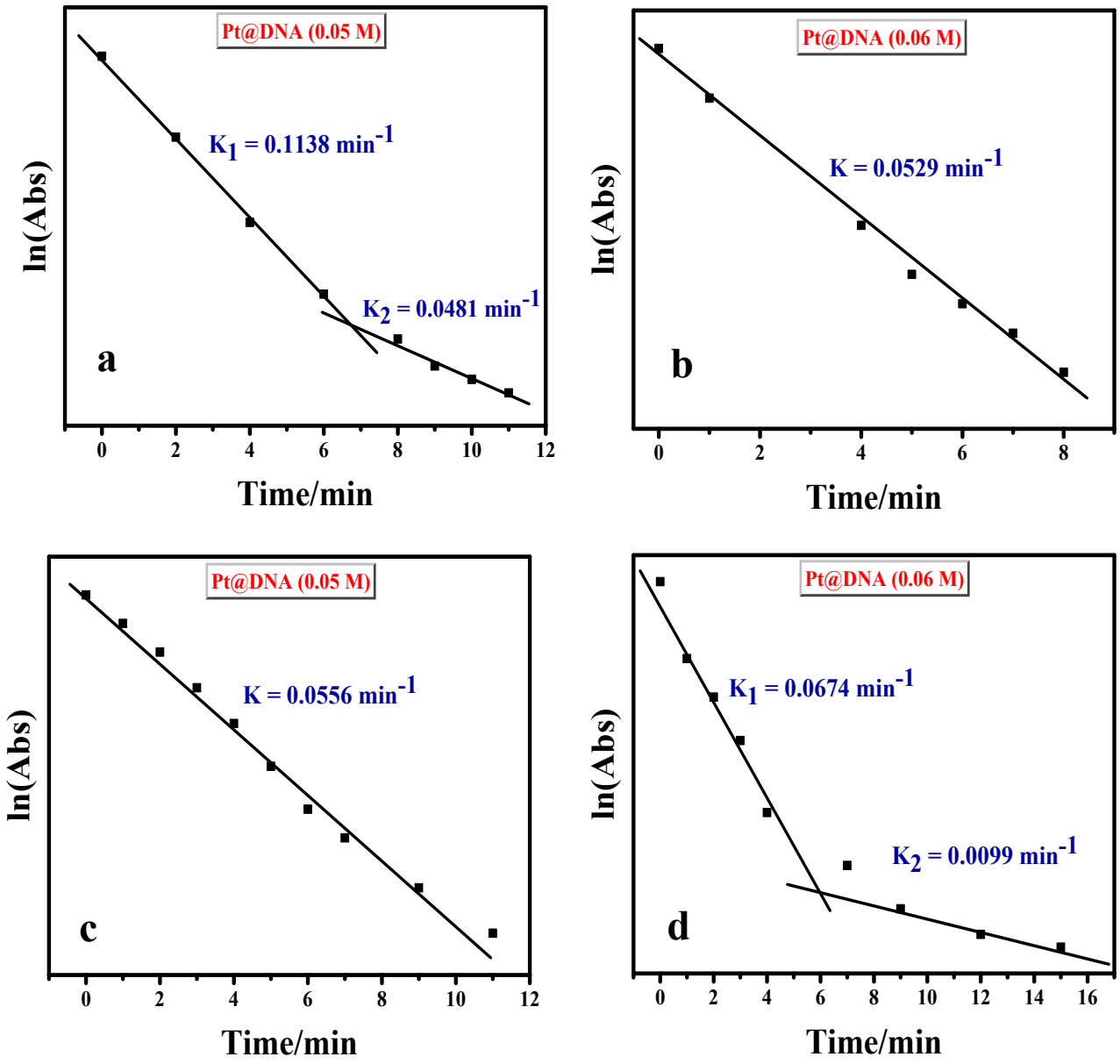

Figure S7: (a and b) are the ln (Abs) vs. Time (min) plot for reduction of 4-NP, (c and d) are the ln (Abs) vs. Time (min) for reduction of 4-NB.

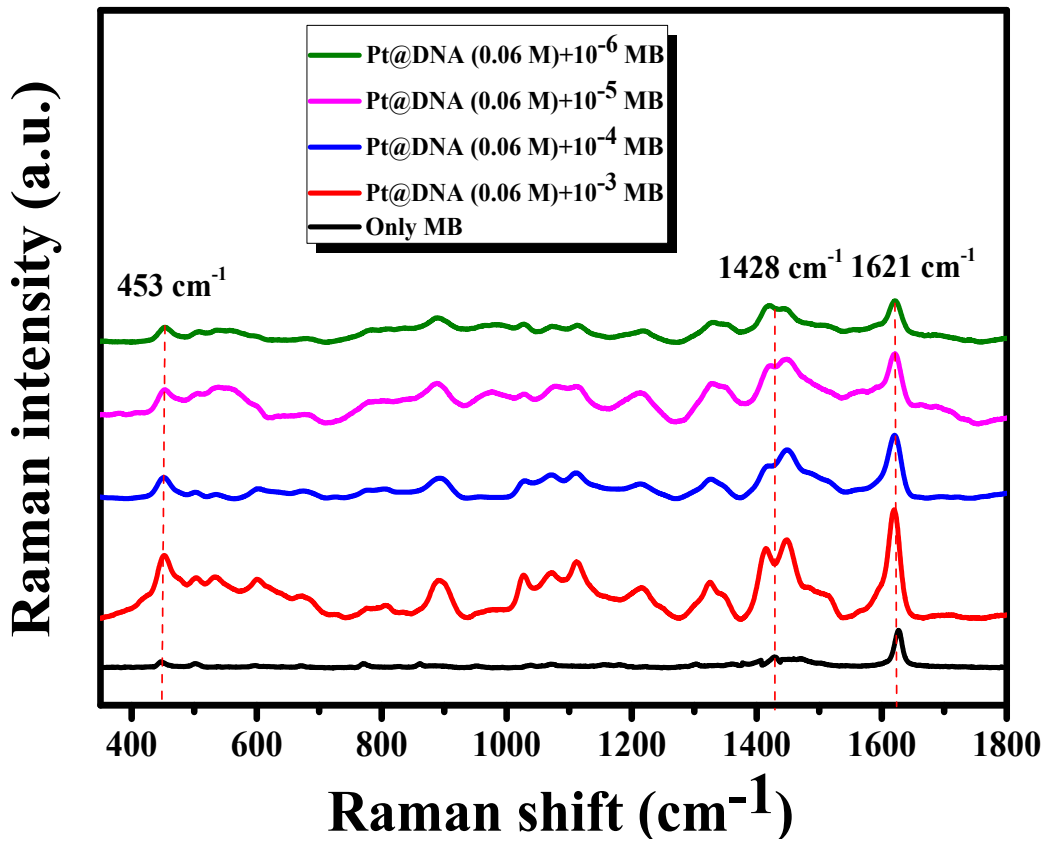

Figure S8: Shows the SERS spectra of MB probe molecule with Pt@DNA (0.06 M) organosol.

Table S1. Concentration of nitro compounds and $NaBH_4$ used for reduction in presence of Pt@DNA organosol as catalyst.

S. No	Initial conc. of Pt^{4+} ions (M)	Volume of metal solution (mL)	Volume of DNA solution (mL)	Volume of EtOH (mL)	Amount of $NaBH_4$ (mg)	Observation
1	0.01	1	1	10	10	Not stable
2	0.01	1	2	9	10	Not stable
3	0.01	1	3	8	10	Not stable
4	0.01	1	4	7	10	Not stable
5	0.01	1	5	6	10	More Stable
6	0.01	1	6	5	10	More Stable
7	0.01	1	7	4	10	Not stable
8	0.01	1	8	3	10	Not stable

Table S2. Concentration of nitro compounds and $NaBH_4$ used for nitro compound reduction in presence of Pt@DNA organosol as catalyst.

S. No	Nitro compounds	Volume of Nitro compounds (µL)	Volume of Water (mL)	Volume of 0.1 M $NaBH_4$ solution (µL)	Volume of Pt@DNA organosol catalyst (µL)
1	4-Nitrophenol (4-NP)	50	5	100	100
2	2-Nitrophenol (2-NP)	75	5	100	100
3	4-Nitrobenzaldehyde (4-NB)	75	5	100	100
4	2-Nitroaniline (2-NA)	75	5	100	100

Table S3. Observed Selectivity, yield, TON, TOF and corresponding rate constants for the reduction of nitro compounds namely 4-NP, 4-NB, 2-NA and 2-NP by using Pt@DNA organosol as catalysts with concentrations of 0.05 M and 0.06 M.

Sl. No.	Reactant	Catalyst	Time (min)	Selectivity (%)	Yield (%)	TON $\times 10^2$	TOF $\times$ 10^2 (h^{-1})	1st order rate constant (k) $\times$ 10^{-2}
1	4-NP	Pt@DNA (0.05 M)	38	100	92	131.42	207.61	6.86
		Pt@DNA (0.06 M)	29	100	96	115.66	239.31	**8.43**
2	4-NB	Pt@DNA (0.05 M)	20	100	90	128.57	386.09	6.87
		Pt@DNA (0.06 M)	10	100	93	112.04	672.51	7.45
3	2-NA	Pt@DNA (0.05 M)	11	100	80	114.28	624.48	8.09
		Pt@DNA (0.06 M)	8	100	88	106.02	795.34	5.29
4	2-NP	Pt@DNA (0.05 M)	18	100	80	114.28	380.93	5.56
		Pt@DNA (0.06 M)	15	100	85	102.40	409.60	3.86

Table S4. Comparison table for catalytic reduction capability of Pt@-DNA organosol with other reported compounds. *(all given ref. are available in main manuscript)

Materials	**Self-assembled methods**	**Reactant**	**Rate constant (min^{-1})**	**Ref.***
Re NPs	PAH-scaffold	4-NP	1.52×10^{-1}	1
DNA-Ag nanowire	DNA-assembly	4-NP	2.82×10^{-2}	2
Au NPs	Trisodium citrate	4-NP	0.976×10^{-2}	3
Au@DNA	DNA assisted	4-NA	9.09×10^{-2}	4
Au, Ag, Pd decorated silica nanotube	di-peptide assisted	4-NP	7.3×10^{-3}	5
Pt NPs in aqueous medium	DNA-assisted	4-NP	7.4×10^{-2}	6
Rh-DNA organosol	DNA- assisted	4-NP	4.32×10^{-2}	7
Pt@DNA	DNA-assisted	4-NP, 2-NP, 4-NB and 4-NA	8.43×10^{-2} (4-NP), 3.86×10^{-2} (2-NP), 7.45×10^{-2} (4-NB), 5.29×10^{-2} (4-NA)	This work

Table S5. Enhancement factors (EF) obtained with different molar ratios of methylene blue (MB) like 10^{-3}, 10^{-4}, 10^{-5} and 10^{-6} M Pt@DNA (0.05 M) organosol.

Sl. No	Concentration of probe molecule MB (M)	Catalyst	EF Value		
			Peak @1626 cm^{-1}	Peak @1395 cm^{-1}	Peak @447 cm^{-1}
1	10^{-3}	Pt@DNA (0.05 M)	9.626×10^2	1.458×10^3	2.180×10^3
2	10^{-4}	Pt@DNA (0.05 M)	5.100×10^3	6.083×10^3	9.752×10^3
3	10^{-5}	Pt@DNA (0.05 M)	3.498×10^4	4.861×10^4	6.934×10^4
4	10^{-6}	Pt@DNA (0.05 M)	2.917×10^5	4.250×10^5	4.941×10^5

Table S6. Enhancement factors (EF) obtained with different molar ratios of MB like 10^{-3}, 10^{-4}, 10^{-5} and 10^{-6} M Pt@DNA (0.06 M) organosol.

Sl. No	Concentration of probe molecule MB (M)	Catalyst	EF Value		
			Peak @1621cm^{-1}	Peak @1428 cm^{-1}	Peak @453 cm^{-1}
1	10^{-3}	Pt@DNA (0.06 M)	4.679×10^2	9.294×10^2	7.686×10^2
2	10^{-4}	Pt@DNA (0.06 M)	2.789×10^3	6.313×10^3	5.877×10^3
3	10^{-5}	Pt@DNA (0.06 M)	2.376×10^4	5.470×10^4	5.683×10^4
4	10^{-6}	Pt@DNA (0.06 M)	1.549×10^5	4×10^5	4.230×10^5

Table S7. Comparison table for SERS enhancement factor with other materials in organic and aq. medium. *(all given ref. are given below)

Sl. No.	Metal NPs	Medium	SERS probe molecules	Enhancement Factor (EF)	Ref.*
1	Ag–Pt	H_2O	R6G	9.1×10^6	[8]
2	Au@Pt	H_2O	4-NTP	1.2×10^6	[9]
3	Os organosol	Acetone	MB	1.62×10^5	[10]
4	Ir@DNA organosol	Ethanol	MB	8×10^5	[11]
5	Pt-DNA	H_2O	MB	2.52×10^5	[6]
6	Rh-DNA Organosol	EtOH	MB	2.89×10^6	[7]
7	Pt@DNA Organosol	EtOH	MB	4.94×10^5	This Work

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