Supporting Information

Environmentally Benign, Facile and Selective Recovery of Gold from Aqueous medium: Synergic Role of Carbon Dots as Green Reductant and Sensor towards Au^{3+} Ions

Kaviyarasan Raji,[a] *Vadivel Ramanan,*[b] *Senthil Kumar Thiyagarajan,*[a] *and Perumal Ramamurthy**[a]

[a]National Centre for Ultrafast Processes, University of Madras, Taramani Campus, Chennai - 600113, Tamil Nadu, India.

[b]Forensic Sciences Department, Government of Tamil Nadu, Chennai - 600004, Tamil Nadu, India.

*Corresponding author E-mail Address: prm60@hotmail.com

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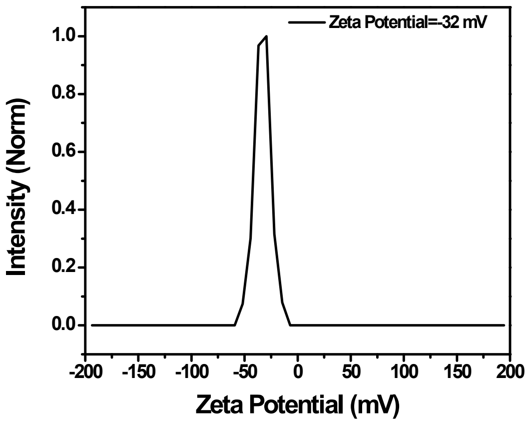


Fig. S1 Zeta potential of the N,S-CDs,

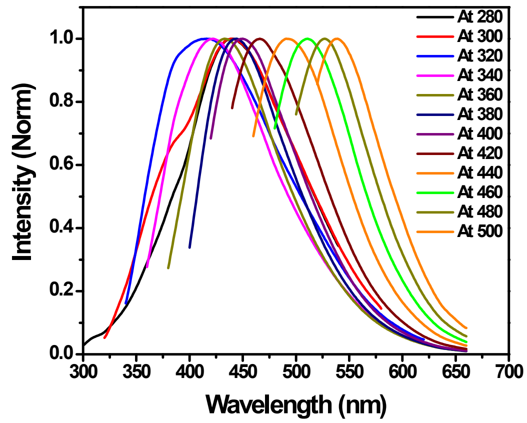


Fig. S2 Normalized PL spectra of N,S-CDs excited at various wavelengths.

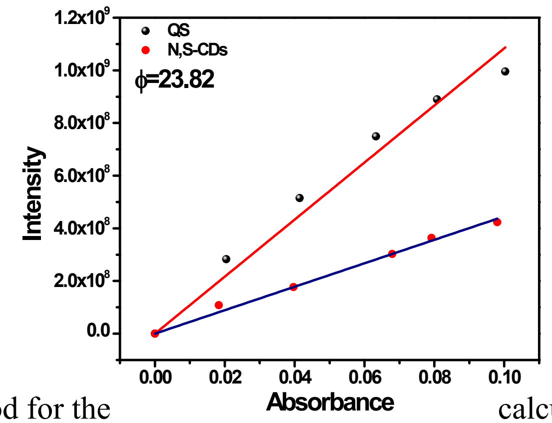


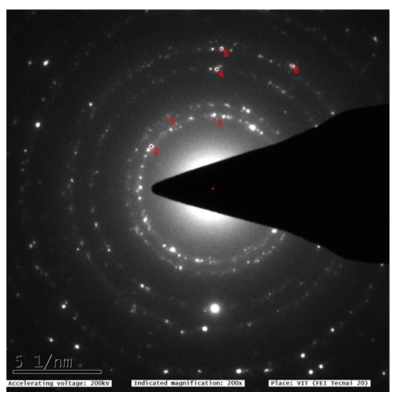
Fig. S3 Slope method for the calculation of PL QY of N,S-CDs.

Table S1. Slope method for the calculation of PL QY of N,S-CDs.

Fluorescer	Slope	QY	QY (%)	Reduced R^2
Quinine Sulphate	1.08×10^{10}	0.5460	54.60 (Known)	0.99
N,S-CDs	4.45×10^{9}	0.2382	23.82	0.99

Table S2. Parameters obtained from the fitting of PL decays at various emission wavelengths (λ_{ex}: 375 nm LED).

S.No	λ_{em}	τ_1 **(ns)**	τ_2 **(ns)**	τ_3 **(ns)**	A_1 **(%)**	A_2 **(%)**	A_3 **(%)**	$\tau_{Average}$ **(ns)**	χ^2
1	400	0.69	3.22	8.52	9.65	52.79	37.57	2.88	1.11
2	425	0.66	3.33	8.57	8.39	49.86	41.75	3.08	1.14
3	450	0.69	3.55	9.25	7.71	49.25	43.03	3.38	1.12
4	500	0.56	3.14	9.06	7.05	39.52	53.43	3.23	1.18
5	550	0.47	2.90	9.18	9.06	37.29	53.65	2.64	1.11
6	600	0.41	2.48	8.39	12.20	35.11	52.69	1.99	1.17



Au NPs

Spot#	d-Spacing (nm)	Rec. Pos.(1/nm)	Degrees to Spot 1	Degrees to x-axis	Amplitude
1	0.2552	3.919	0.00	88.04	1112.29
2	0.2366	4.227	57.60	145.64	6173.00
3	0.2080	4.807	34.48	122.52	940.15
4	0.1476	6.776	0.03	88.07	3720.16
5	0.1260	7.937	1.61	86.43	5320.17
6	0.1204	8.308	30.82	57.22	1819.67

Fig. S4 SAED pattern of obtained Au NPs and corresponding d-spacing values.

Table S3. Comparison of the present probe with existing Au^{3+} probes.

S. No.	Fluorescence Probe	Solvent	LOD	Ref.
1	Rhodamine-based modified polyacrylic acid	0.01 M $TBAPF_6$ in DMSO	11.40 μM	1
2	4-propargylamino-1,8-naphthalimide based probe	PBS buffer (4% C_2H_5OH)	8.44 μM	2
3	Fluorol Red GK	CH^3CN-HEPES buffer (10 mmol L^{-1}, pH 7.4, v : v = 1 : 1)	1.23 μM	3
4	Rhodamine-based modified polyacrylic acid-coated FeNPs	0.01 M $TBAPF_6$ in DMSO	0.85 μM	1
5	Graphene oxide-poly(vinyl alcohol) Hybrid	Water	0.7 μM	4
6	Rhodamine-alkyne derivative	C_2H_5OH-HEPES buffer (0.01 M, pH 7.4) (1:1, v/v)	0.5 μM	5
7	Rhodamine-derived N-propargyl-spirolactam P1	5 mM HEPES buffer containing 0.25% DMSO, pH 7.4	0.4 μM	6
8	Thioamide-phenyl-substituted alkyne	phosphate buffer/C_2H_5OH (3:7, pH 7.0)	390 nM	7
9	Bodipy derivative	PBS buffer (50 % ethanol)	320 nM	8
10	Rhodamine-based semicarbazide	PBS buffer (0.3% DMF)	290 nM	9
11	Thiocoumarin derivative	CH_3CN-acetate buffer solution (1:1, v/v)	111 nM	10
12	Rhodamine-based semicarbazide	PBS buffer (10% CH_3OH)	74 nM	9
13	Rhodamine/BODIPY based	1:1 CH_3CN/HEPES buffer (pH 7.0)	65 nM	11
14	Rhodamine based probe	PBS buffer (1% CH_3OH)	50 nM	12
15	Rhodamine 6G hydrazide	H2O/ C_2H_5OH, 7 : 3 (v/v)	48 nM	13
16	BODIPY based	1:1 phosphate buffer (0.1 M)/ C_2H_5OH, pH 7.0	44 nM	14
17	diketopyrrolopyrrole-based	Water	18 nM	15
18	Rhodamine derivatives	C_2H_5OH: water, 7:3 (v/v), 0.1 M HEPES buffer, pH 7.4	0.5 nM	16
19	N-CDs	Water	64 nM	Ref. 40 in the main article
20	CDs	Water	3.03 μM	17
21	N-CDs	Water	239 nM	Ref. 42 in the main article
22	CDs	Water	53 nM	Ref. 41 in the main article
23	GQDs	Water	50 nM	Ref. 48 in the main article
24	**N,S-CDs**	**Water**	**252 nM**	**Present work**

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