Electronic Supplementary Information

Catalytic performance and SERS substrate Efficiency of PdNPs@GOQDs

Amrutha T. P.[a], Arathi T. P.[a], Ritu Gopal[a], Arya P. B.[a], Nidhisha V.[a], Anjali C.[a], Suja T. D.[a], Sunaja Devi K. R.[b] Suja haridas[c] and Renuka Neeroli Kizhakayil*[a]

[a] Department of Chemistry, University of Calicut, Kerala 673635, India. *Email: renuka@uoc.ac.in

[b] Department of Chemistry, CHRIST (Deemed to be University), Bengaluru, Karnataka 560029, India.

[c] Department of Applied Chemistry, Cochin University of Science and Technology, Kerala 682022, India

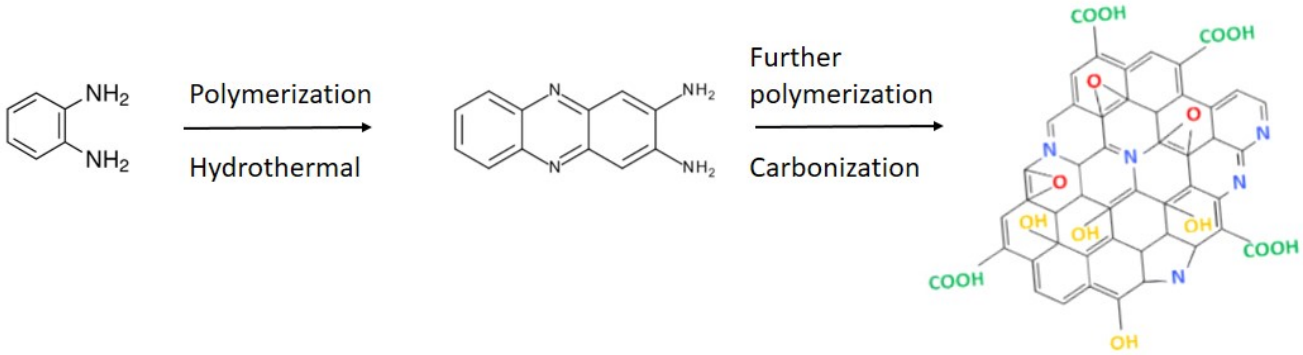


Fig. S1. Mechanism of formation of GOQDs from o-phenylenediamine.

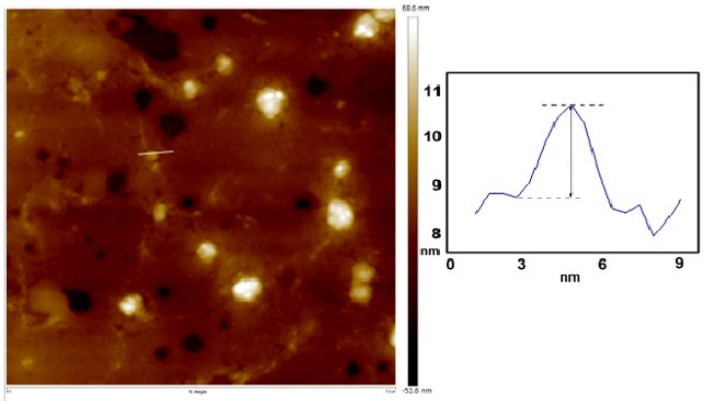


Fig. S2. AFM image of GOQDs (left). Height profile of the single particle marked (right).

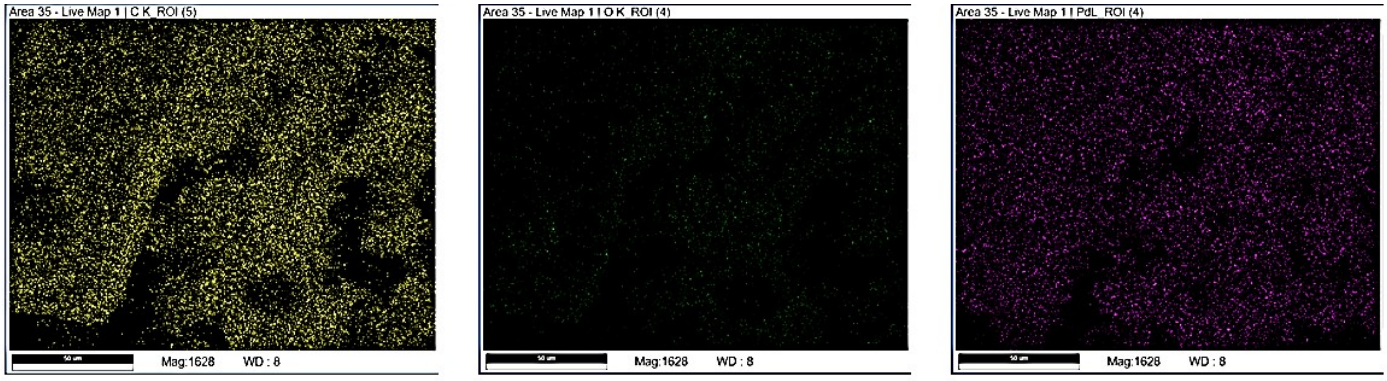


Fig.S3. EDX map of distribution of a) Carbon, Oxygen and Palladium in PdNPs@GOQDs, in the respective order, from left to right.

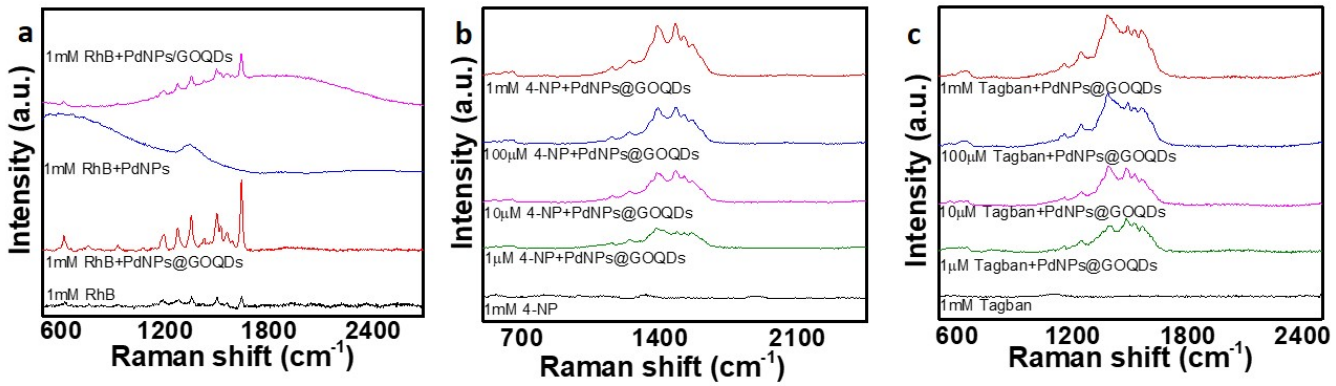


Fig. S4. a) Comparison of SERS activity of PdNPs@GOQDs with pure palladium nanoparticles (PdNPs) and physically mixed palladium nanoparticles and GOQDS (PdNPs/GOQDs) using RhB as the analyte analyte. Different concentrations of b) 4-Nitrophenol (4-NP) and c) Tagban on PdNPs@GOQDs, indicating the SERS substrate efficiency of the system.

Table S1. Comparison of LOD with previous reports.

Material	Analyte	Detection Limit	References
AgNPs/N-CDs	Rhodamine B	10^{-6}M	https://doi.org/10.1021/acssuschemeng.5b01698
Ag-CDs	Uric acid	10^{-8}M	https://doi.org/10.1007/s00604-019-3759-0
Ag@CDs	p-aminothiophenol	10^{-8}M	https://doi.org/10.1021/acsami.6b07807
PdNPs@GOQDs	Rhodamine B	$5x10^{-6}$M	Present work

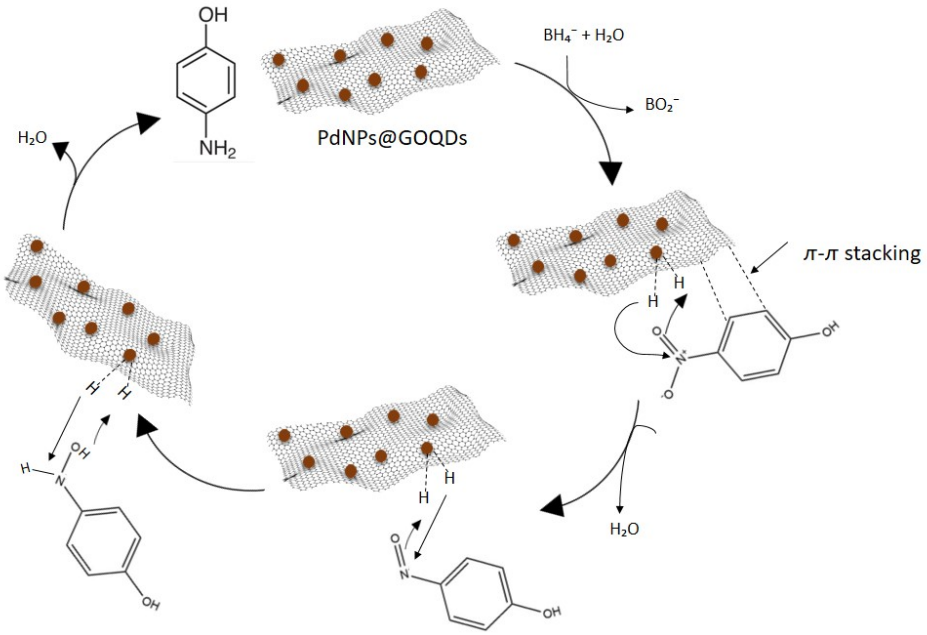


Fig. S5. The mechanism for the catalytic reduction of 4-nitrophenol (4-NP)

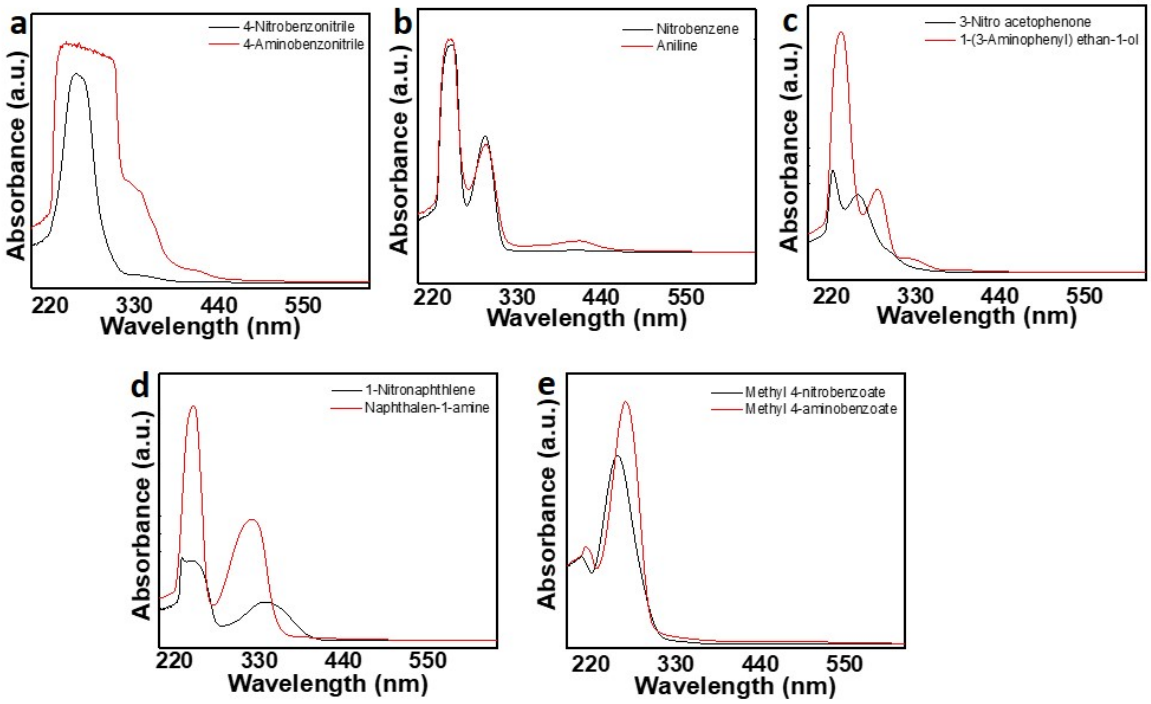


Fig. S6. UV Visible spectral data of the reactants and products. Catalytic hydrogenation of a) 4-Nitrobenzonitrile b) Nitrobenzene c) 3-Nitroacetophenone d) 1-Nitronaphthalene and e) Methyl 4-nitrobenzoate using PdNPs@GOQDs.

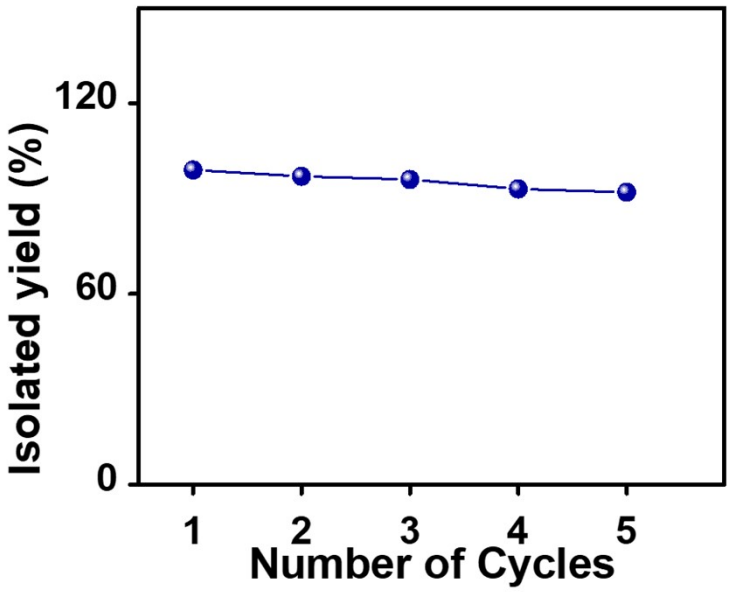


Fig. S7. The catalytic reusability of PdNPs@GOQDs with nitrobenzene as reactant.

Table S2.^{1}H NMR DATA

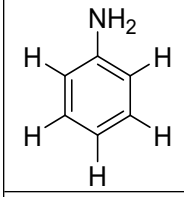
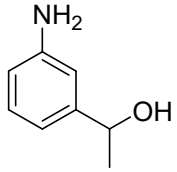
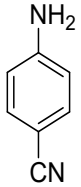
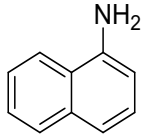
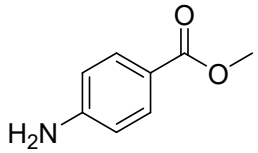
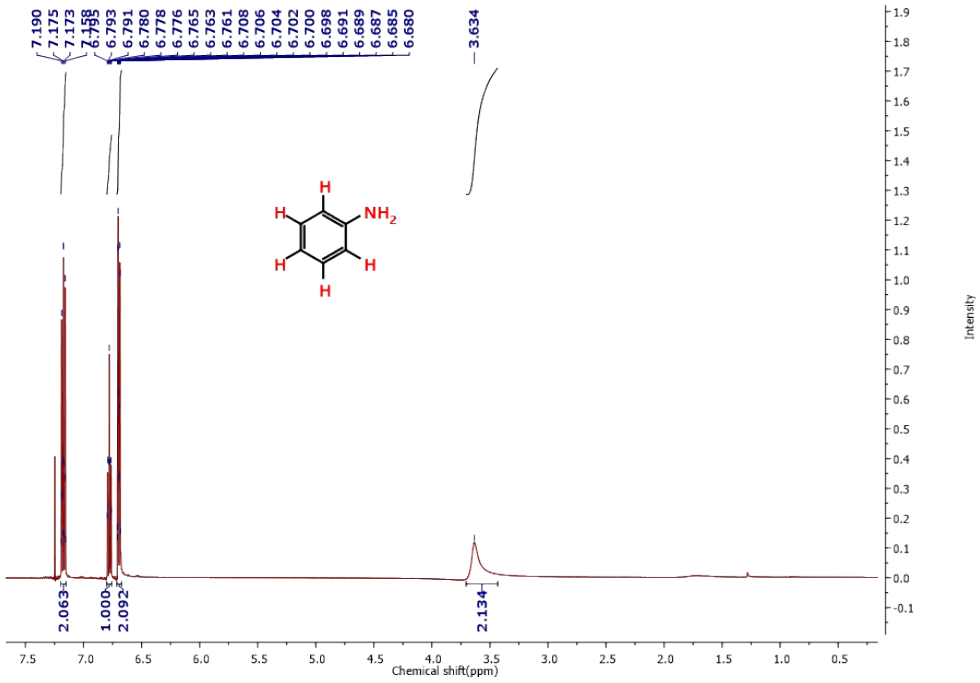
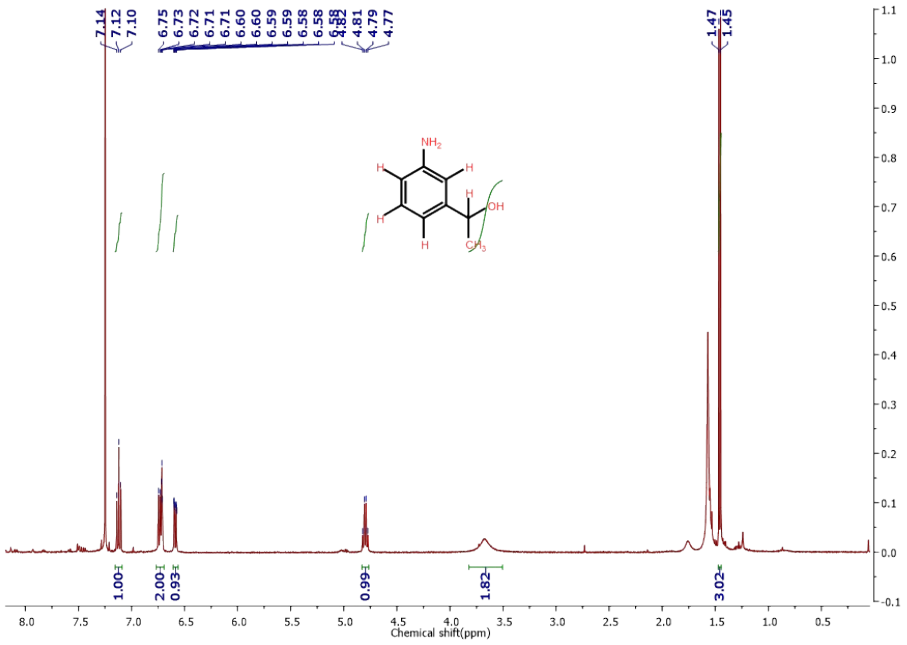
	**Aniline**: ^{1}H NMR : 7.16-7.19 (2H, m), 6.76-6.79 (1H, m), 6.68-6.70 (2H, m), 3.63(broad s)
	**1-(3-aminophenyl)ethan-1-ol**: ^{1}H NMR : 7.12 (1H, t, *J* =8 Hz), 6.71-6.75b (2H, m), 6.57-6.60 (1H, m), 4.80 (1H, q, *J* =8 Hz), 3.63 (broad s), 1.46 (3H, d, *J*=8 Hz)
	**4-aminobenzonitrile:** ^{1}H NMR: 7.39-7.41 (2H, m), 6.62-6.66 (2H,m), 4.14 (2H,broad s)
	**Naphthalen-1-amine:** ^{1}H NMR:7.76-7.83 (2H, m),7.42-7.47 (2H, m),7.27-7.32 (2H, m),6.77-6.79 (1H, m), 4.14 (2H, broad s)
	**Methyl 4-aminobenzoate:** ^{1}H NMR: 7.84 (2H, d, *J* = 8 Hz), 6.63 (2H, d, *J* = 8 Hz), 4.04 (2H, broad s), 3.84 (3H, s)

Fig.S8 ^{1}H NMR spectra of

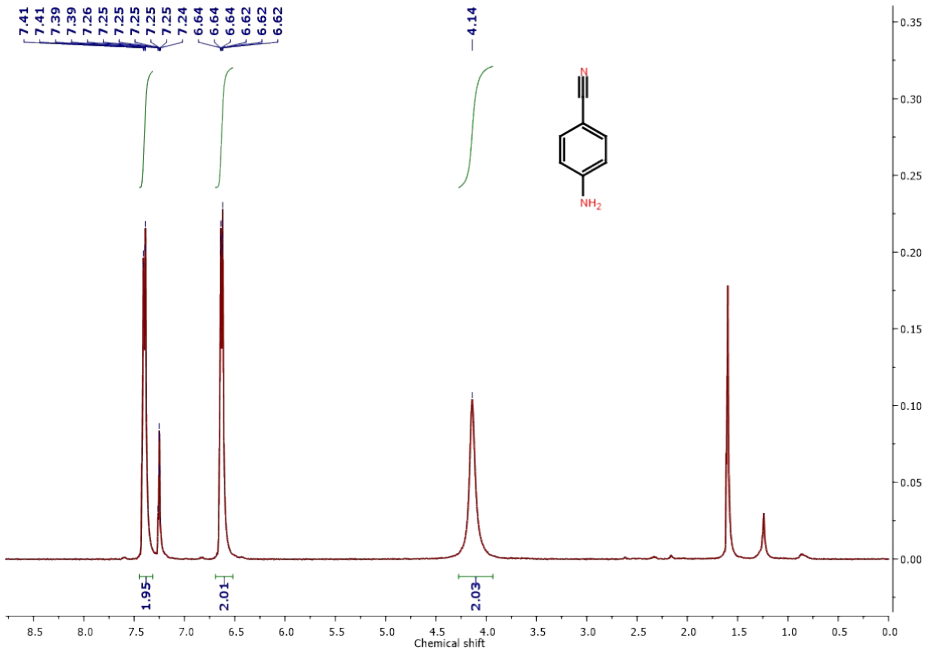
a) Aniline



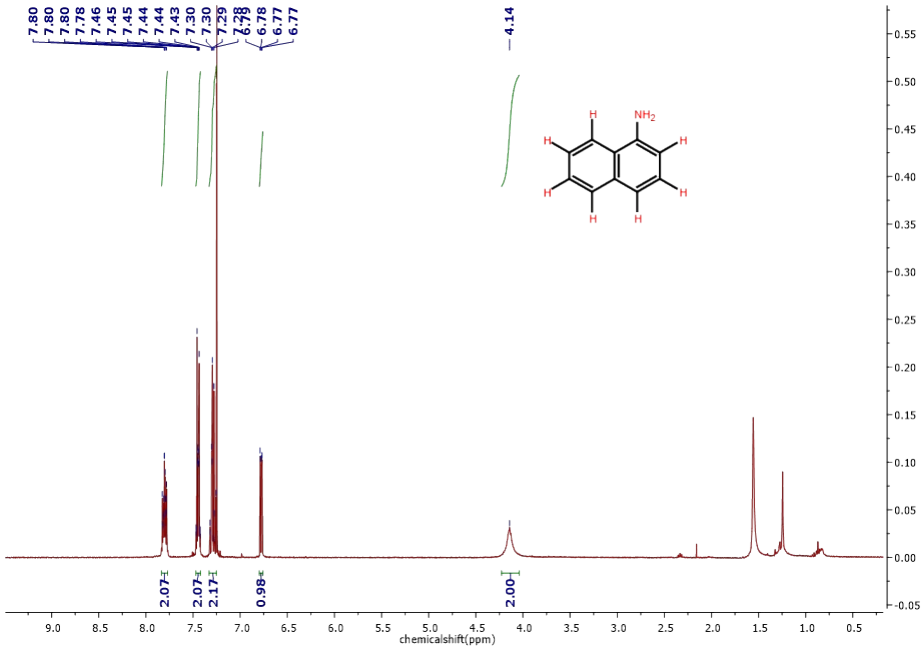
b) **1-(3-aminophenyl)ethan-1-ol**



c) 4-aminobenzonitrile



d) Naphthalen-1-amine



e) Methyl 4-aminobenzoate