Electronic Supplementary Material (ESI) for Analyst.

Ultramicro and Ultrasensitive Detection of Lipopolysaccharide Based on Triple-Signal Amplification via Ultrafast ATRP and Ultramicroelectrode

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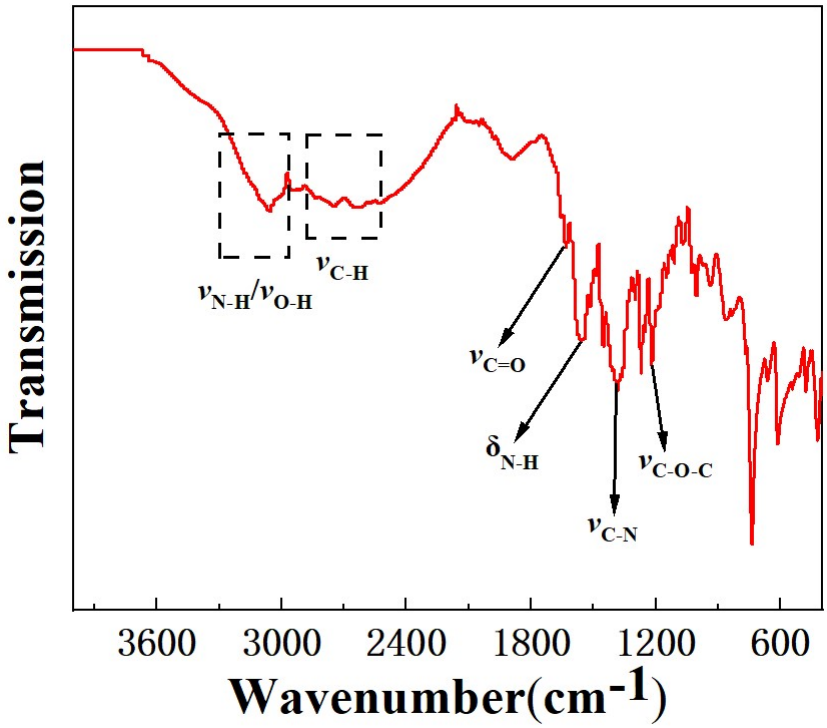

Fig. S1 FTIR characterization of CQDs

FTIR analysis showed that there were abundant surface groups on the surface of N-CQDs (Fig. S1).The wide band at 3310-3550 cm^{-1} is caused by the stretching vibrations of O-H and N-H. The peak at 2928 cm^{-1} is attributed to the C-H bond. The peak at 1639 cm^{-1} can be attributed to C=O tensile vibration. The peaks at 1271, 1402, 1582 and 1621 cm^{-1} belong to the tensile vibrations of C-O-C, C-N, C=C and C=N, respectively。

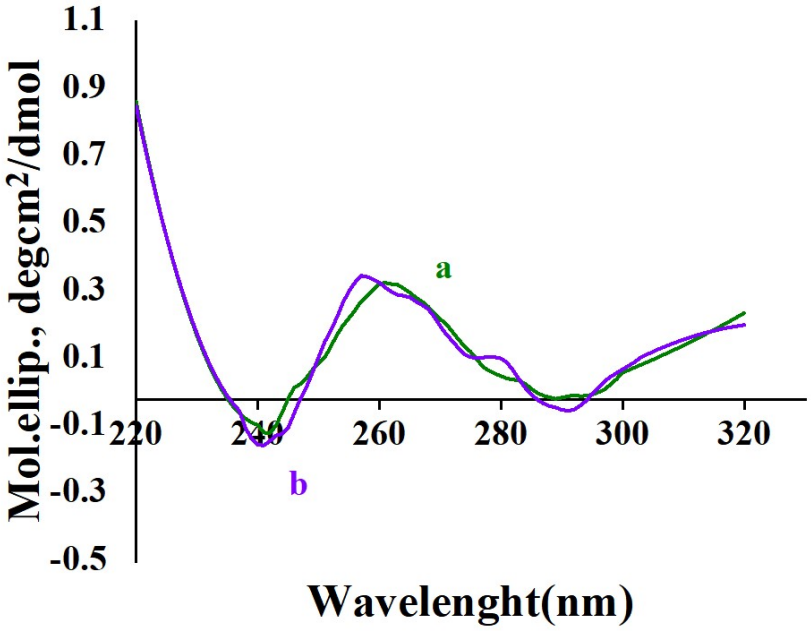

Fig. S2 CD of Apt in buffer (a) and polymeric solution and irradiate for 2.5 min(b).

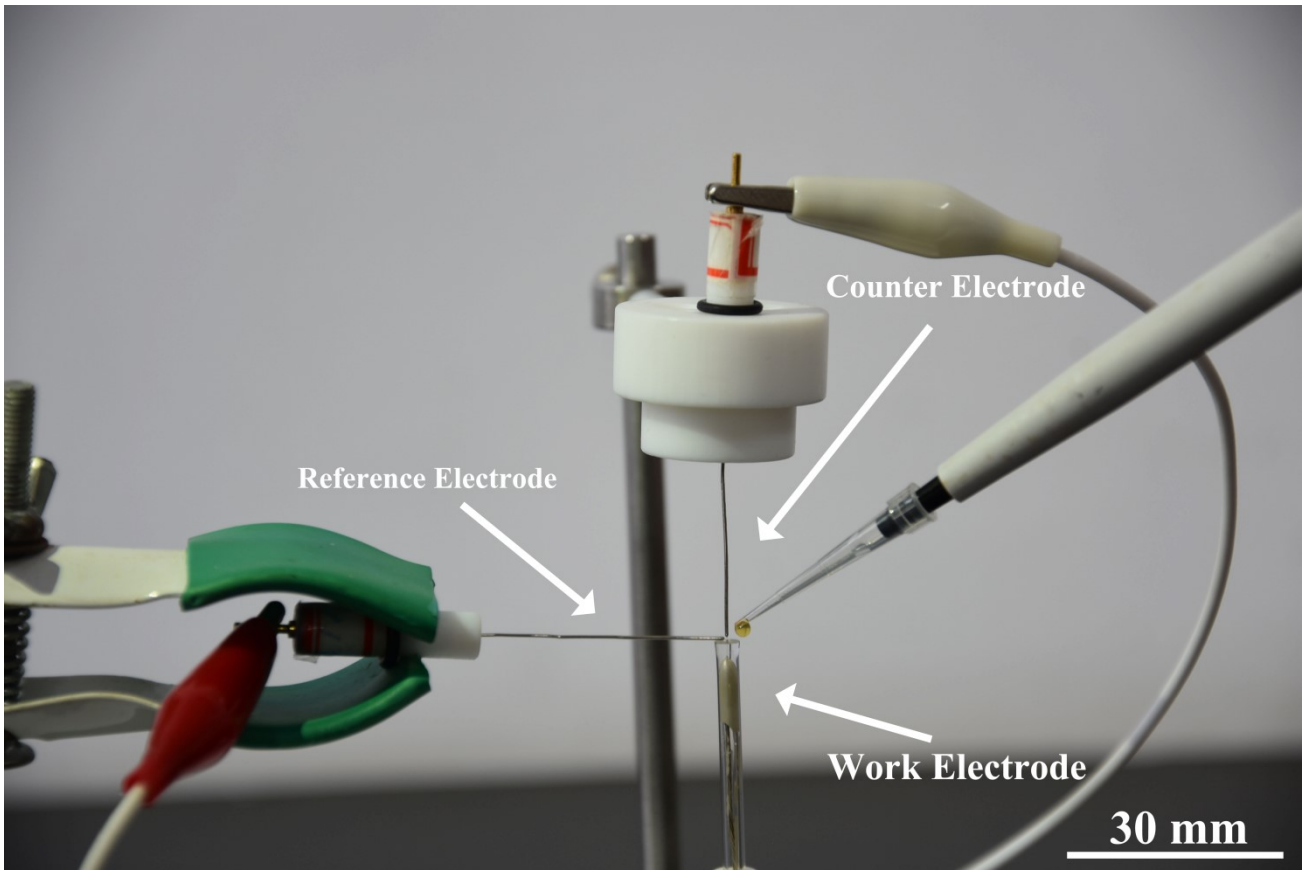

Fig. S3 Device diagram of ultramicro system

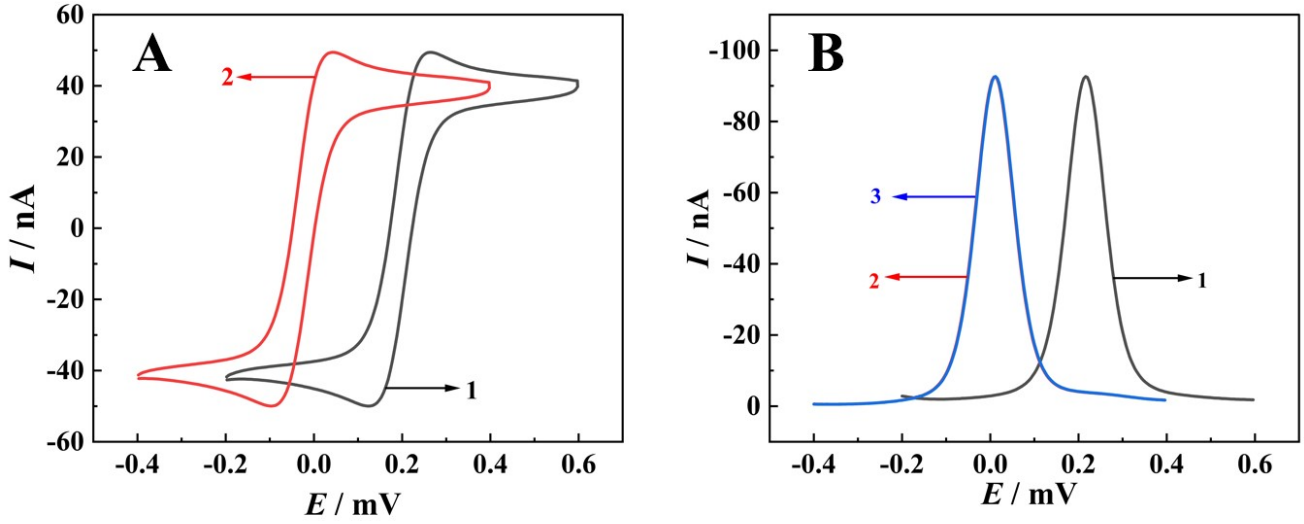

Fig. S4 CV (A) and DPV (B) results of using different reference electrodes in different volumes of electrolyte (PBS containing 5 mM $[Fe(CN)_6]^{3-/4-}$ and 0.1 M KCl). 1-SCE in 10 mL; 2-PME in 10 mL; 3-PME in 5 μL

Table S1 The properties of PME characterized by DPV

	1	2	3	4	5	RSD%
I_p (nA)	906.4	909.5	904.3	903.7	911.8	0.54
E_p (V)	0.004	0.004	0.003	0.004	0.005	0.01

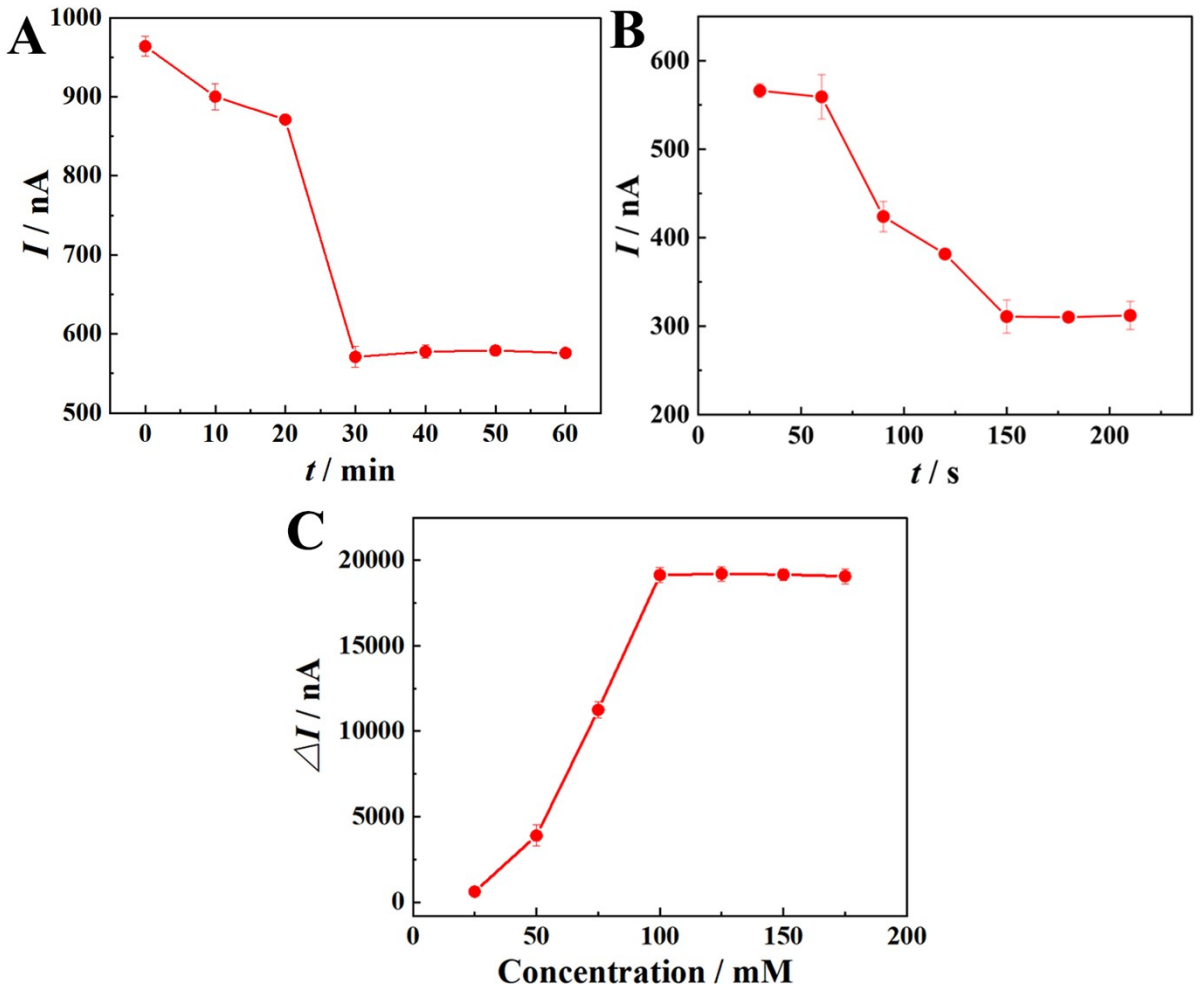

Fig. S5 (A)Effect of the Initiator link time on the BPA/LPS/Apt/nAu/Au UME; (B) Effect of the polymerization time on the PMLA/LPS/Apt/nAu/Au UME; (C) Effect of the silver ammonia solution concentration on the AgNPs/PMLA/LPS/Apt/nAu/Au UME.

Table S2 Comparison between AgNPs/PMLA/LPS/Apt/nAu/Au UME and similar sensors for LPS detection

Strategy	Detection Methods	Linear response range (pg/mL)	LOD (pg/mL)	Detection volumes (μL)	Ref.
Base on Cu^{2+}-modified metal-organic framework	DPV	$1.5\text{-}7.5\times10^{5}$	6.10×10^{-1}	10	[1]

Base on dsDNA-templated fluorescent copper nanoparticles	fluorescence	10^3-10^8	9.50×10^2	10^5	[2]
Base on logical circuit by CRISPR/Cas12a-driven guanine nanowire assisted non-cross-linking hybridization chain reaction	RRS	10^3-10^5	0.17	600	[3]
Base on boronic ester-mediated dual recognition coupled with a CRISPR/Cas12a system	fluorescence	5.0×10^1-5.0×10^6	44.86	80	[4]
Base on Raw264.7 cells	DPV	10-3000	3.50	50	[5]
Base on collaboration of dual enzymes	EIS	2.5-10^3	1.00	50	[6]
Based on boronate affinity and (4-(ferrocenylacetamido)phenyl)boronic acid	SWV	1.0-10^3	0.34	10	[7]
Base on LAL	LAL	0.1-3.0	0.10	200	[8]
Based on UATRP and UME	SWV	10^{-4}-10^8	7.99×10^{-2}	5	This work

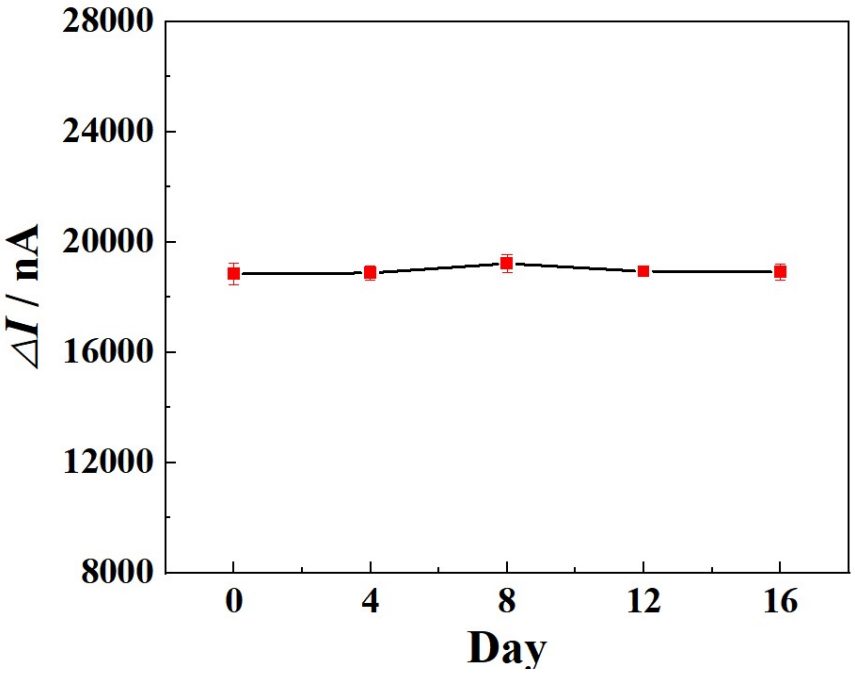

Fig. S6 Stability of the sensor (0-16 days).

References

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