Electronic Supplementary Material (ESI) for Analyst.

Supplementary information

Vertically paired electrode for redox cycling and its application to immunoassays

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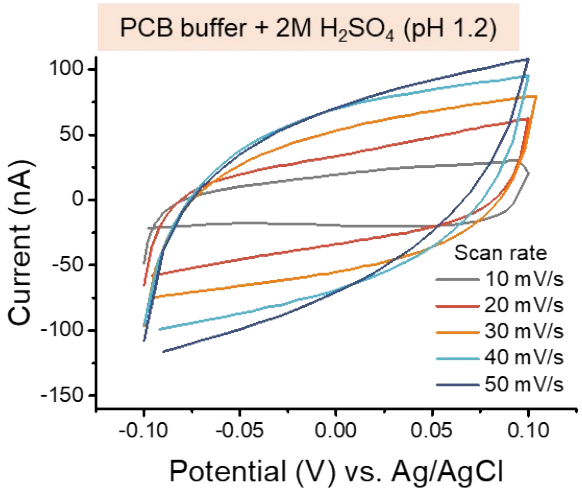
Fig. S1 Electrochemical properties of electrode materials. (a) CV diagram of PEDOT:PSS electrode at various scan rates under non-redox electrolyte (PCB buffer + 2M H_2SO_4) for the estimation of pH effect on double-layer capacitance (C_{dl}). (b) Electron transfer rate constant (k_{app}) of PEDOT:PSS electrode in a 50 mM ferricyanide and 1 M KCl at pH 1.2 from the peak potential separation ($\Delta E_p = E_{ap} - E_{cp}$) between the cathodic ($E_{cp}$) and anodic peaks ($E_{ap}$) of CV diagram.

(a)



(b)

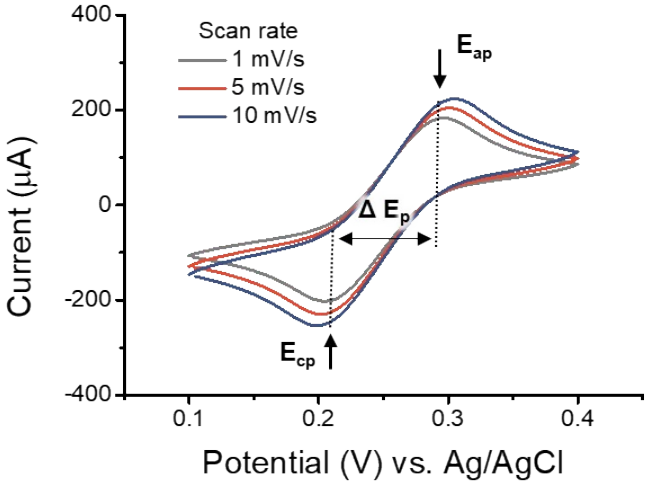
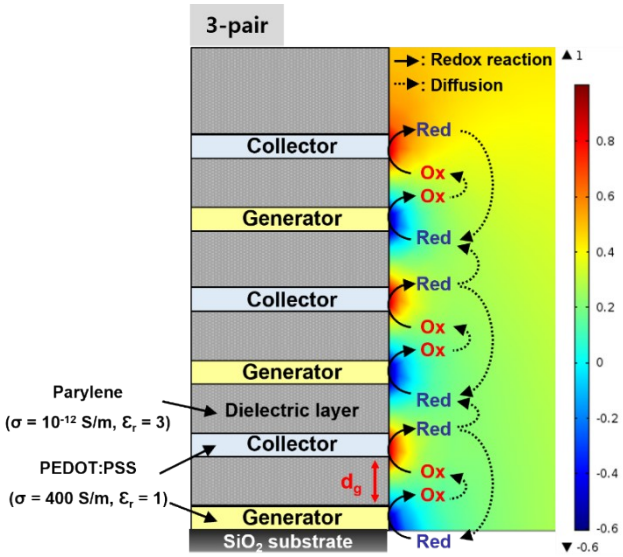
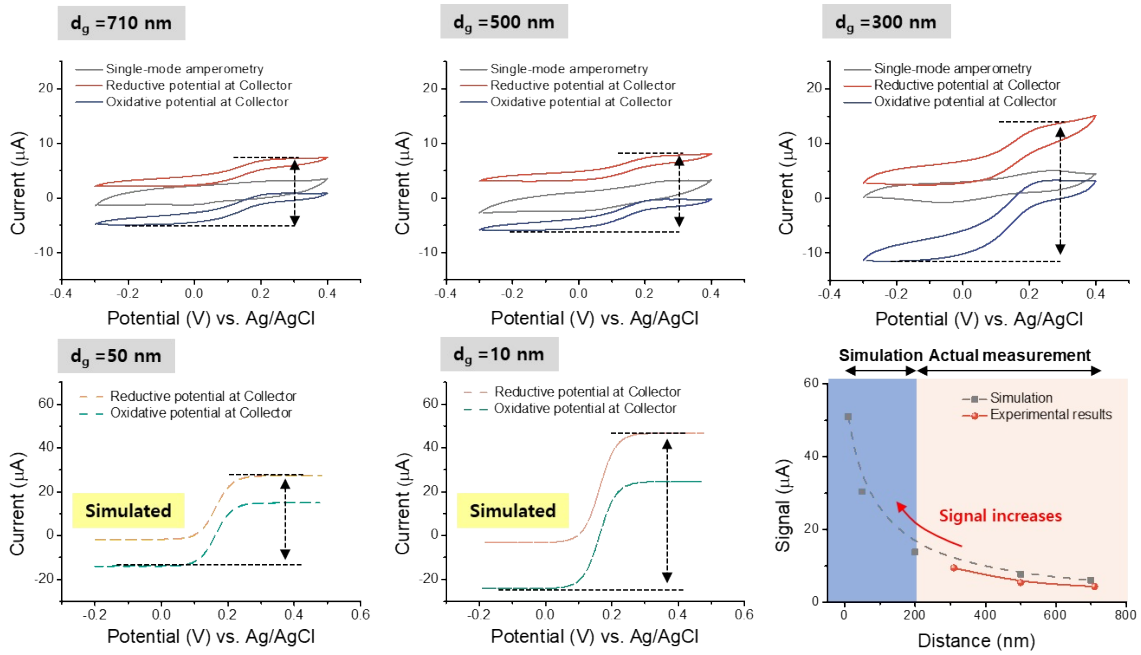


Fig. S2 Computer simulation for VPE optimization. (a) Simulation model of VPE finite element method and the current distribution during the redox cycling. (b) Simulation data of redox cycling signal for VPE with different electrode gaps. (c) Simulation data of redox cycling signal for VPE with different electrode pairs.

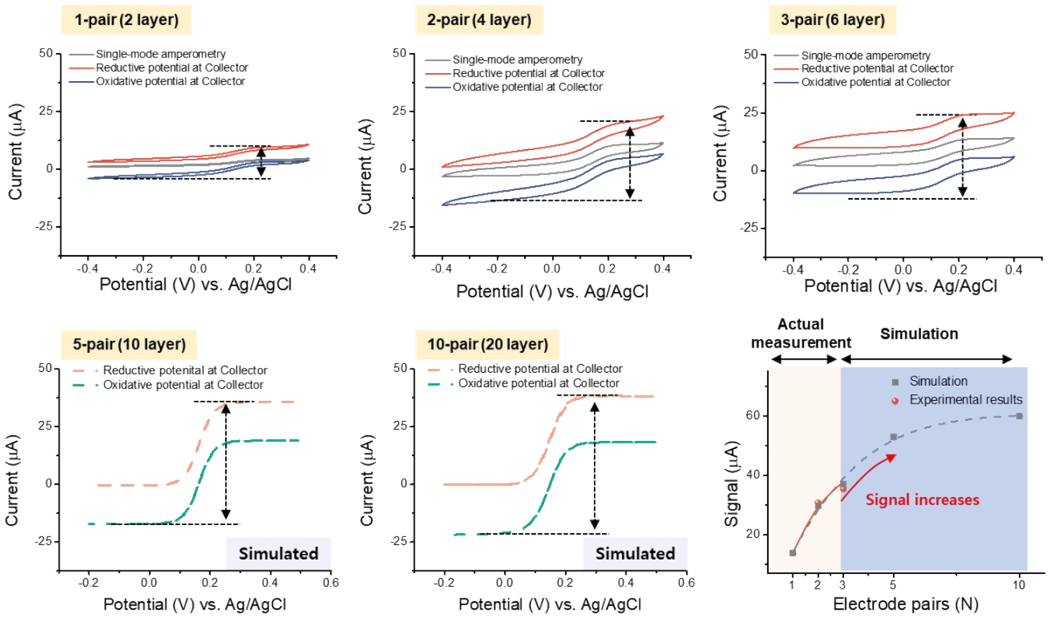
(a)



(b)



(c)


1-pair (2 layer)
2-pair (4 layer)
3-pair (6 layer)
Single-mode amperometry
Reductive potential at Collector
Oxidative potential at Collector
Current (μA)
Potential (V) vs. Ag/AgCl
5-pair (10 layer)
10-pair (20 layer)
Reductive potenital at Collector
Oxidative potential at Collector
Simulated
Actual measurement
Simulation
Experimental results
Signal increases
Signal (μA)
Electrode pairs (N)