Electronic Supplementary Information (ESI)

Optimization of gold-palladium core-shell NWs towards H_2O_2 reduction by adjusting shell thickness

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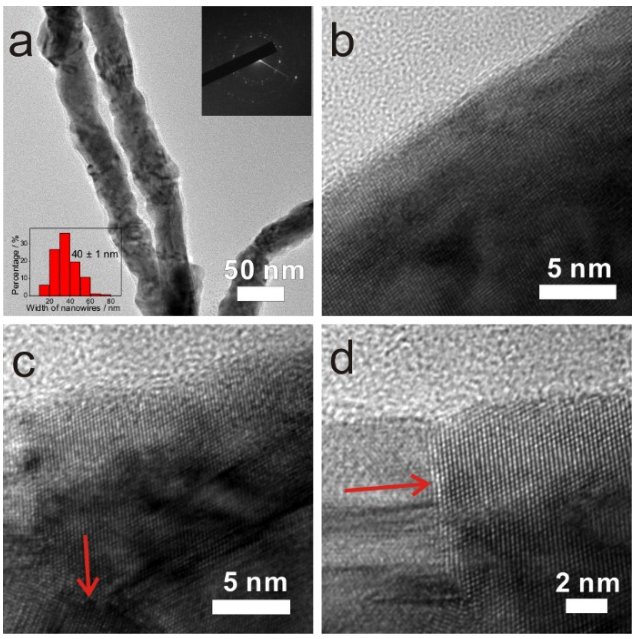

Figure S1. (a) TEM image of $Au_{75}Pd_{25}$ NWs. The top right inset is the corresponding selected area electron diffraction (SAED) pattern and the bottom left inset is the size distribution histogram of nanowires' width. HRTEM images showing the area of (b) single crystaline, (c) twin boundary and (d) stacking fault in a nanowire.

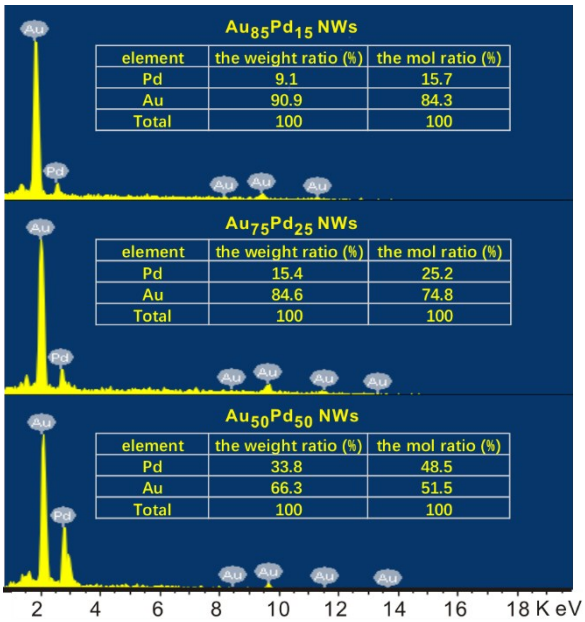

Figure S2. EDX spectra and their coresponding elements contents of Au-Pd nanowires with different Au/Pd ratios.

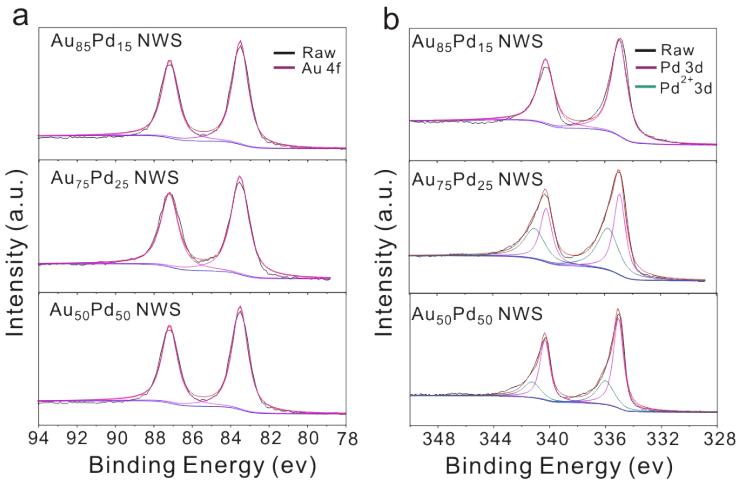

Figure S3. (a) Au 4f and (b) Pd 3d XPS spectra of Au-Pd nanowires with different Au/Pd ratios.

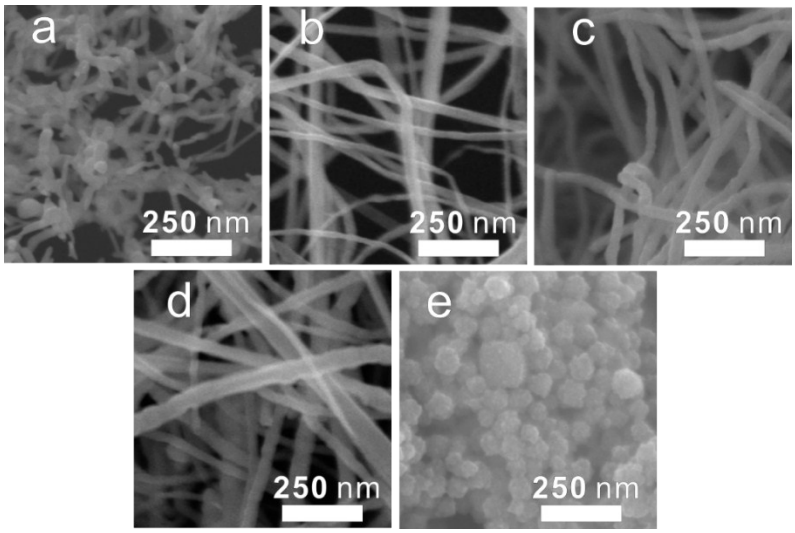

Figure S4. SEM images of the as-synthesised products formed by controlling Au/Pd feeding ratio: (a) Au NWs, (b) $Au_{85}Pd_{15}$ NWs, (c) $Au_{75}Pd_{25}$ NWs, (d) $Au_{50}Pd_{50}$ NWs, (e) Pd NPs.

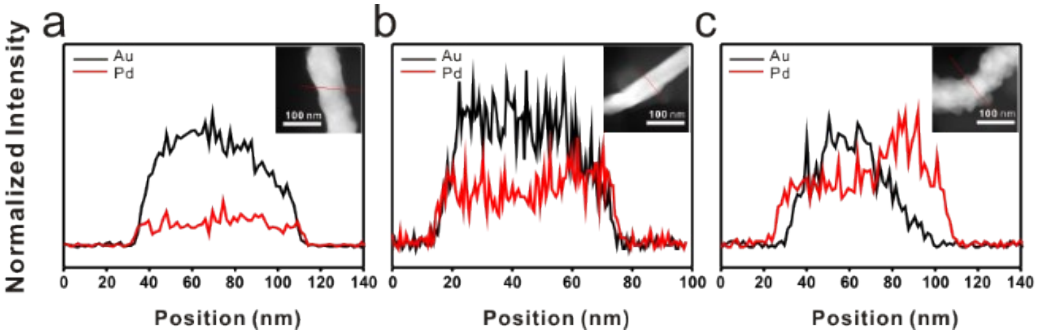

Figure S5. Cross-sectional compositional line profiles of (a) $Au_{85}Pd_{15}$ NWs, (b) $Au_{75}Pd_{25}$ NWs, (c) $Au_{50}Pd_{50}$ NWs.

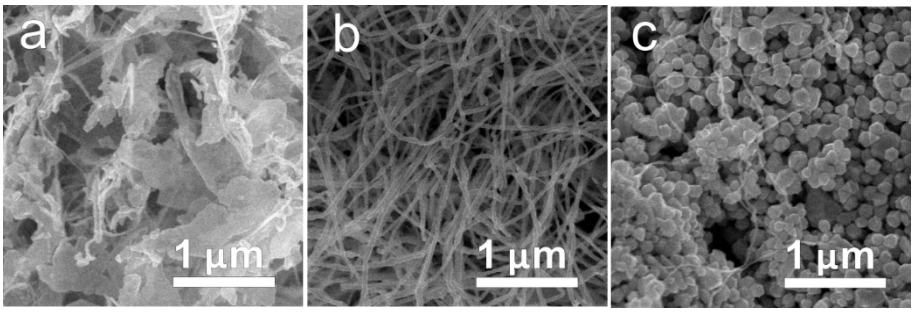

Figure S6. SEM images of products synthesized at different temperatures: (a) 6 °C, (b) 30 °C, (c) 50 °C.

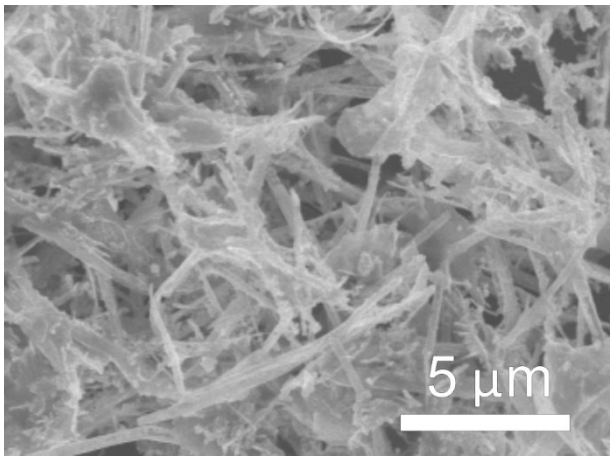

Figure S7. SEM image of the product synthesized with OTAB.

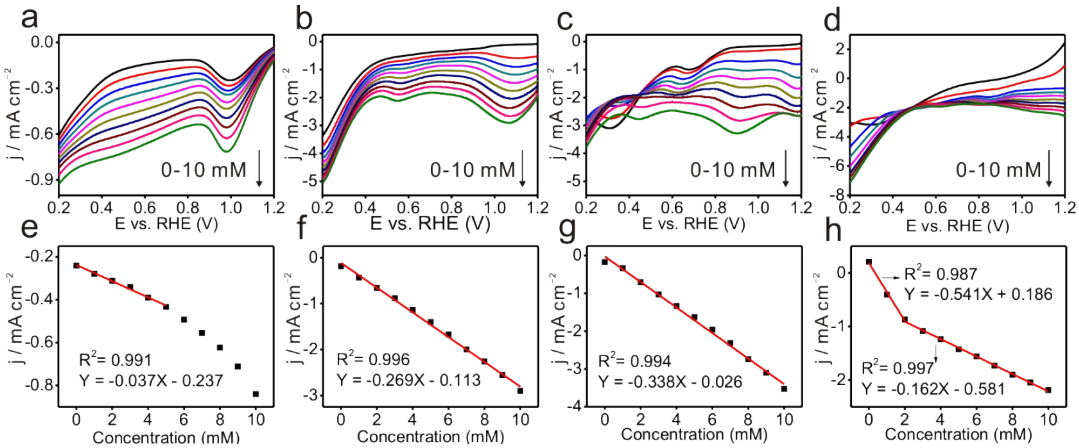

Figure S8. (a-d) LSV curves of H_2O_2 reduction and (e-f) their corresponding H_2O_2 calibration curves at 0.97 V for Au NWs, $Au_{85}Pd_{15}$ NWs, $Au_{75}Pd_{25}$ NWs, $Au_{50}Pd_{50}$ NWs, respectively.

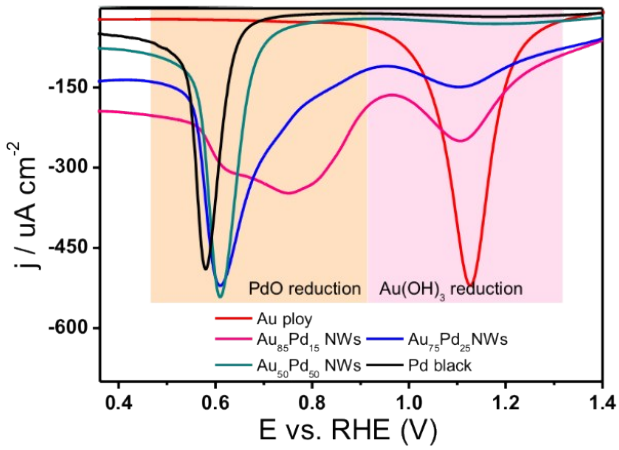

Figure S9. CV curves of Au polycrystaline electrode (AuPoly), Au-Pd nanowires with different Au/Pd ratios and Pd black in 0.5 M H_2SO_4 solution.

Table S1 Comparison of the H_2O_2 sensing performance in this work with that of other Au-Pd nanomaterials.

Sensing materials	Sensitivity mM^{-1} cm^{-2})	(μALinear range	Detection limit	Ref.
Au NWs assembling spheres	6.25	up to 0.8 mM	1.2 μM	[45]
Pd/PEDOT	215	2.5 μM -1.0 mM	2.84 μM	[48]
PdNP/AuNAE	533	up to 2 mM	5 μM	[16]
AuPd nanocrystals	195.3	up to 3 mm	8.4 μM	[47]
AuPd@GR	186.9	5 μM -11.5 mM	1 μM	[49]
Au-Pd/MoS_2/GCE	184.9	0.8 M - 10 mM	0.16 μM	[50]
hAu_1Pd_4/GCE	5095.5	0.1-20 μM	0.02 μM	[51]
Au_{rich}Pd@$AuPd_{rich}$ NWs	355	up to 10 mM	50μM	This work