Supplementary Information for

# Microstructure, electrocatalytic and sensing properties of nanoporous $Pt_{46}Ni_{54}$ alloy nanowires fabricated by mild dealloying

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## Calculation of the Pt loading on nanoporous $Pt_{46}Ni_{54}$ nanowire electrode

The Pt loading for nanoporous $Pt_{46}Ni_{54}$ nanowire electrode can be estimated from the Pt content of the electrodeposited $Pt_4Ni_{96}$ nanowires, assuming reasonably there was no Pt loss during the dealloying treatment. The Pt loading can be expressed:

$$M_{Pt} = \rho \times S_{cell} \times D_{pore} \times F \times V_{NW} \times W$$

$$= \rho \times S_{cell} \times D_{pore} \times F \times \pi (R_{NW})^2 \times L_{NW} \times W \qquad \text{(S1)}$$

where $\rho$ = 8.9 g $cm^{-3}$ is the density of nickel (assuming that the density of $Pt_4Ni_{96}$ alloy is approximately equal to that of nickel); $S_{cell}$ represents the exposed area of the electrochemical cell; $D_{pore}$ stands for the pore density of the AAO membranes ($1\times10^{10}$ $cm^{-2}$ for $H_2C_2O_4$-anodized AAOs); $F$ represents the degree of filling of the electrodeposited nanowires (typically 80~95 %); $V_{NW}$ is the volume of a single electrodeposited $Pt_4Ni_{96}$ nanowire; $R_{NW}$ and $L_{NW}$ represent the radius and length of $Pt_4Ni_{96}$ nanowires ($R_{NW}$ = 22.5 nm according to TEM observation and $L_{NW} \approx$ 2.1 μm for 5 min electrodeposition at -1.0V vs. Ag/AgCl according to SEM examination, Figure S1); $W$ stands for the weight percentage of Pt in $Pt_4Ni_{96}$ alloy (~12 %). Taking $S_{cell}$ = 0.95 $cm^2$, $D_{pore}$ = $1\times10^{10}$ $cm^{-2}$, $F$ = 0.9, $R_{NW}$ = 22.5 nm, $L_{NW}$ = 2.1 μm and $W$ = 12 % into the equation S1, the Pt loading is calculated as:

$M_{Pt} = 8.9\ gcm^{-3} \times 0.95\ cm^2 \times 1 \times 10^{10}\ cm^{-2} \times 0.9 \times \pi \times (22.5\ nm)^2 \times 2.1\ \mu m \times 12\ \%$

$= 30.5\ \mu g$

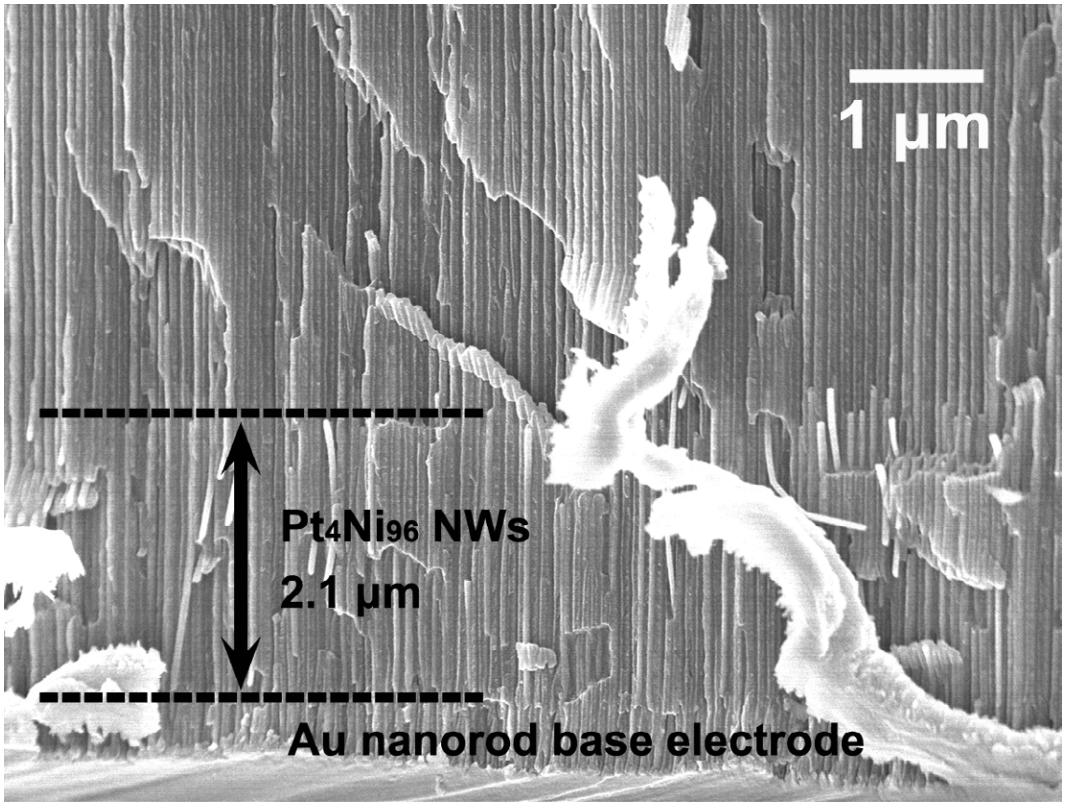


**Figure S1.** A cross-sectional SEM image of the electrodeposited $Pt_4Ni_{96}$ nanowires embedded in the AAO membrane, which were used to determine the length of $Pt_4Ni_{96}$ nanowires for estimating the Pt loading. The electrodeposition was performed at -1.0V (vs. Ag/AgCl) for 5 min at room temperature.