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$_4$Ni$_{96}$ nanowires, assuming reasonably there was no Pt loss during the dealloying treatment. The Pt loading can be expressed:

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

\[ = \rho \times S_{cell} \times D_{pore} \times F \times \pi (R_{NW})^2 \times L_{NW} \times W \]  

(S1)

where \( \rho = 8.9 \text{ g cm}^{-3} \) is the density of nickel (assuming that the density of Pt$_4$Ni$_{96}$ 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 (\( 1 \times 10^{10} \text{ cm}^{-2} \) for H$_2$C$_2$O$_4$-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$_4$Ni$_{96}$ nanowire; \( R_{NW} \) and \( L_{NW} \) represent the radius and length of Pt$_4$Ni$_{96}$ nanowires (\( R_{NW} = 22.5 \text{ nm} \) according to TEM observation and \( L_{NW} \approx 2.1 \mu\text{m} \) 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$_4$Ni$_{96}$ alloy (~12 %). Taking \( S_{cell} = 0.95 \text{ cm}^2, D_{pore} = 1 \times 10^{10} \text{ cm}^{-2}, F = 0.9, R_{NW} = 22.5 \text{ nm}, L_{NW} = 2.1 \mu\text{m} \) and \( W = 12 \% \) into the equation S1, the Pt loading is calculated as:
$M_{\text{Pt}} = 8.9 \text{ g cm}^{-3} \times 0.95 \text{ cm}^2 \times 1 \times 10^{10} \text{ cm}^2 \times 0.9 \times \pi \times (22.5 \text{ nm})^2 \times 2.1 \mu m \times 12\% \\
= 30.5 \mu g$

**Figure S1.** A cross-sectional SEM image of the electrodeposited Pt$_4$Ni$_{96}$ nanowires embedded in the AAO membrane, which were used to determine the length of Pt$_4$Ni$_{96}$ nanowires for estimating the Pt loading. The electrodeposition was performed at -1.0V (vs. Ag/AgCl) for 5 min at room temperature.