

Surface Reorganization on Cobalt Phosphide Nanowire Arrays for Efficient Alkaline Hydrogen Evolution Reaction

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Experiment Design

Table 1. Free energy of different facets of CoO with and without intermediates.

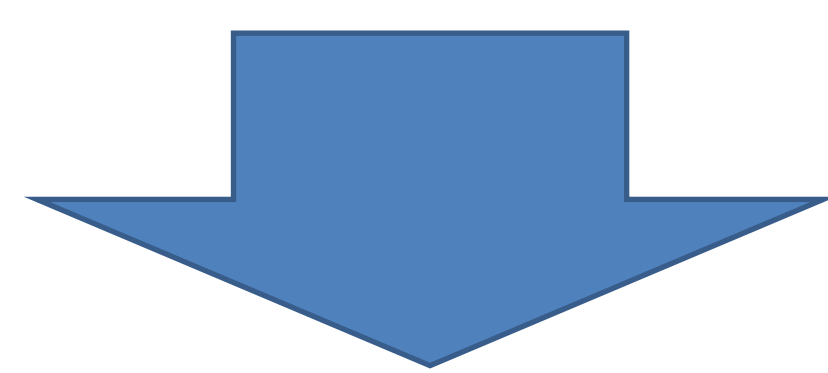
| | state | {100} | {110} | {111} |
|------------------|------------------|---------|---------|---------|
| Free energy (eV) | Clean surface | -372.65 | -736.32 | -722.08 |
| | H ₂ O | -390.63 | -757.26 | -736.89 |
| | E _{ads} | 3.75 | 6.68 | 0.58 |

Table 2. Free energy of {011} facet of CoP with and without intermediates.

| | state | {011} |
|------------------|------------------|---------|
| Free energy (eV) | Clean surface | -162.41 |
| | H ₂ O | -176.90 |
| | E _{ads} | 0.26 |

Different H₂O adsorption energy for cobalt phosphide and cobalt oxide

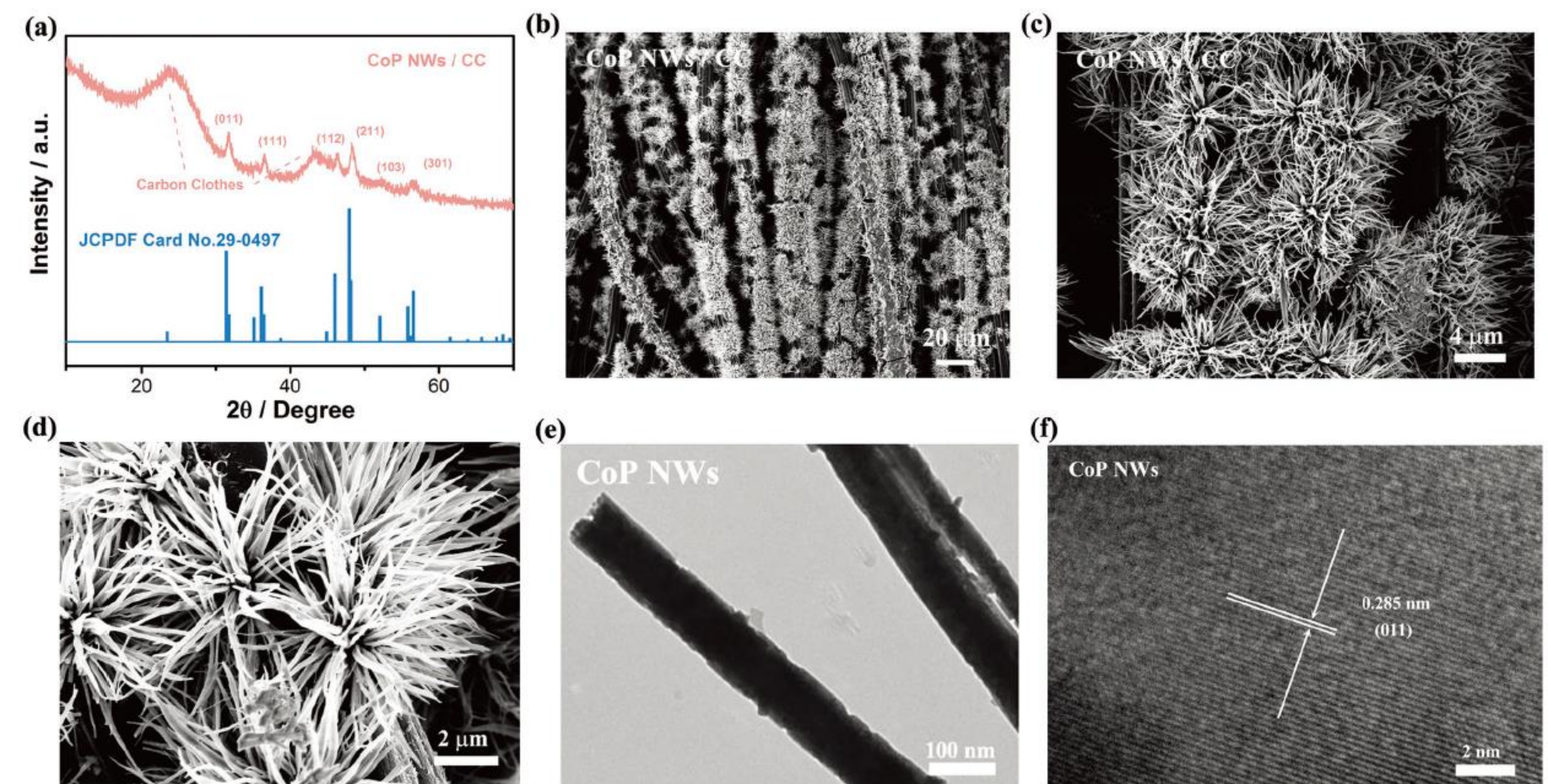
Modulation of intermediate adsorption energy



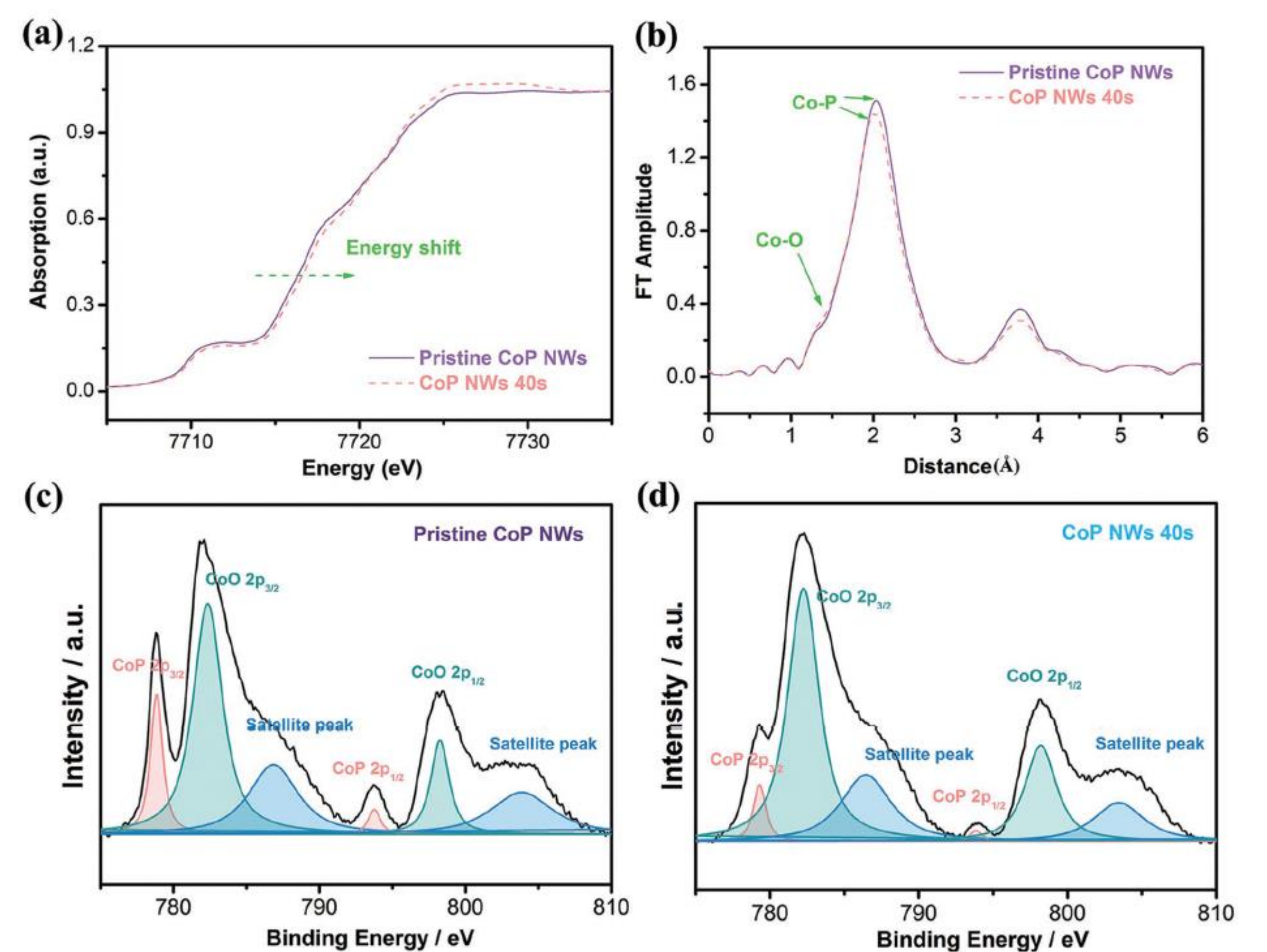
Using oxygen plasma to fabricate cobalt oxide CoO_x on the surface of cobalt phosphide

Differnet plasma engraving time

Structure analysis

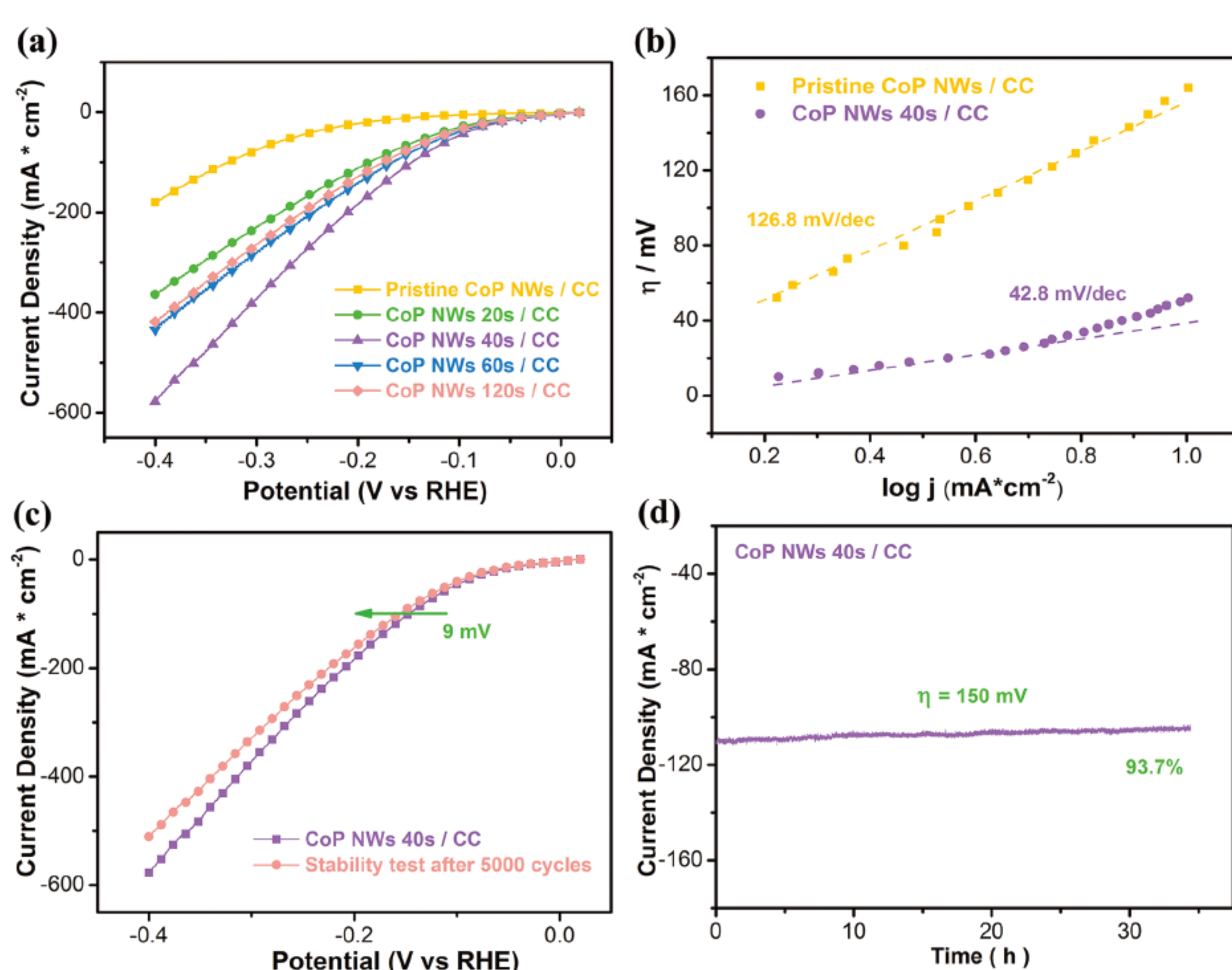


Successful synthesis of cobalt phosphide arrays on carbon paper



CoO_x generation after plasma engraving

Electrochemical measurements

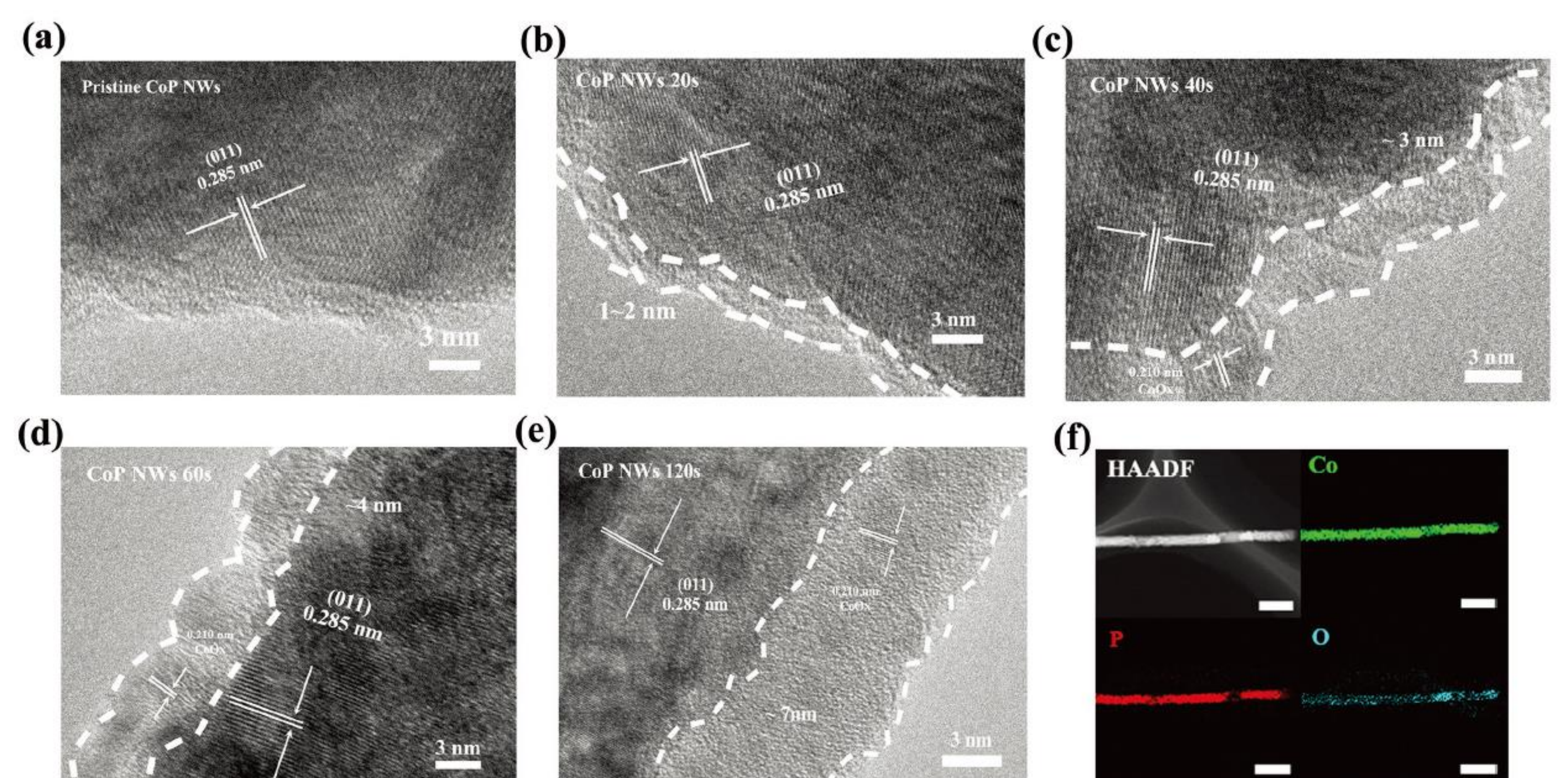


Enhanced alkaline HER activity and a 180 mV

decreased overpotential at 100 mA cm⁻²

Outstanding long-time stability

Mechanism Understanding



~2 nm amorphous layer

CoP/CoO_x interface generation

Controlled by plasma engraving time