Supporting Information

# Oxygen-vacancy-rich CoOx modified cubic platinum nanoparticles for highly efficient electrocatalytic ammonia oxidation reaction

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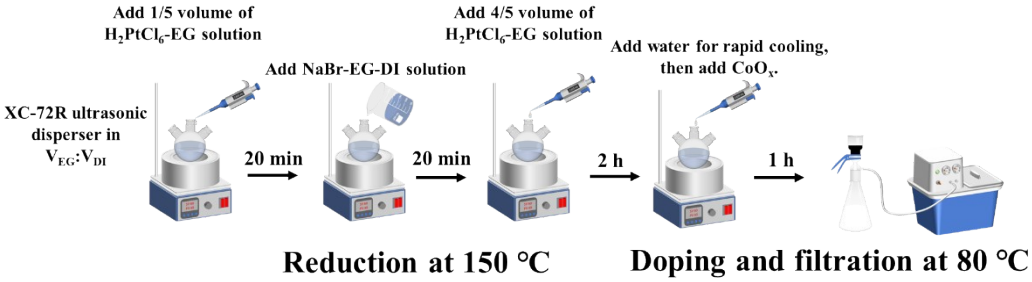


Figure. S1 Synthesis process of ammonia electrooxidation catalysts.

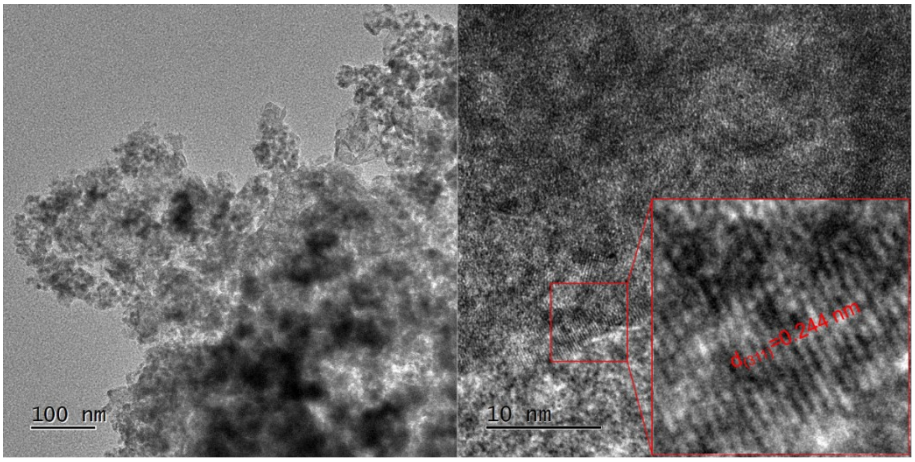


Figure. S2 TEM images of $V_O$-rich $CoO_x$.

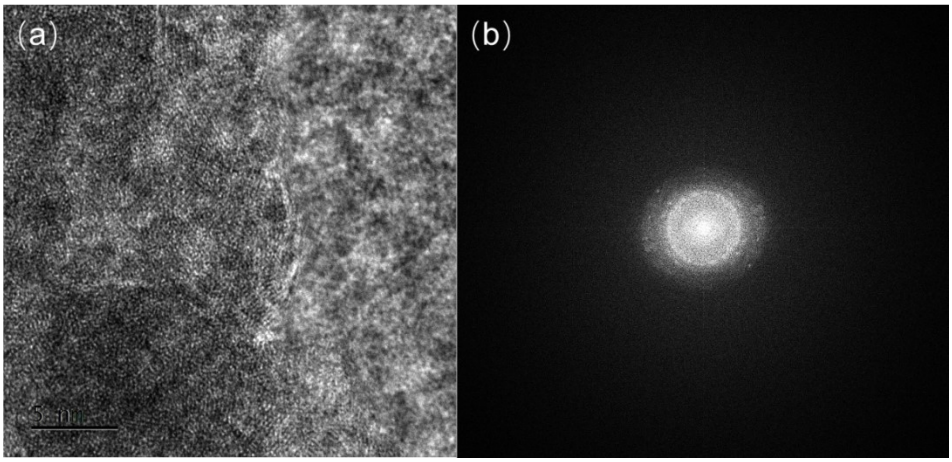

Figure. S3 (a) TEM images of $V_O$-rich $CoO_x$ (b) Diffraction pattern of $V_O$-rich $CoO_x$.

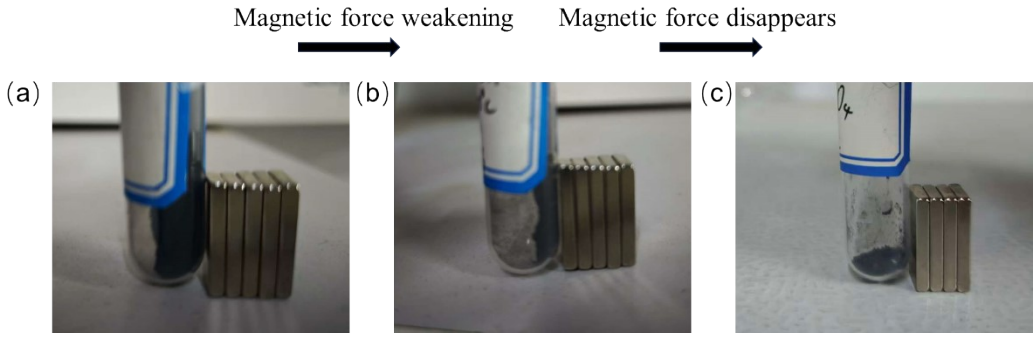


Figure. S4 Magnetic Properties of Different CoOx Samples (a) $V_O$-rich $CoO_x$, (b) $V_O$-poor $CoO_x$, (c) $V_O$-free $Co_3O_4$.

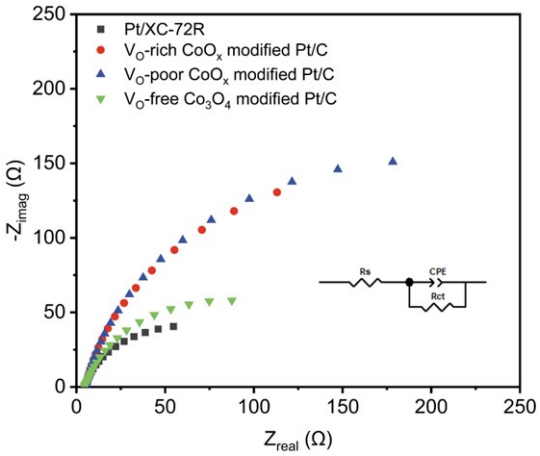


Figure. S5 Nyquist plots of EIS spectra measured for different catalysts in 1 M KOH + 0.1 M $NH_3 \cdot H_2O$ at the 0.6 V vs. RHE.

Table. S1 Rs and Rct of different catalysts.

| | Rs (Ω) | Rct (Ω) |
|---|---|---|
| Pt/XC-72R | 4.633 | 101.4 |
| $V_O$-rich $CoO_x$ modified Pt/C | 4.656 | 370.3 |
| $V_O$-poor $CoO_x$ modified Pt/C | 4.677 | 378.4 |
| $V_O$-free $Co_3O_4$ modified Pt/C | 4.766 | 151.8 |

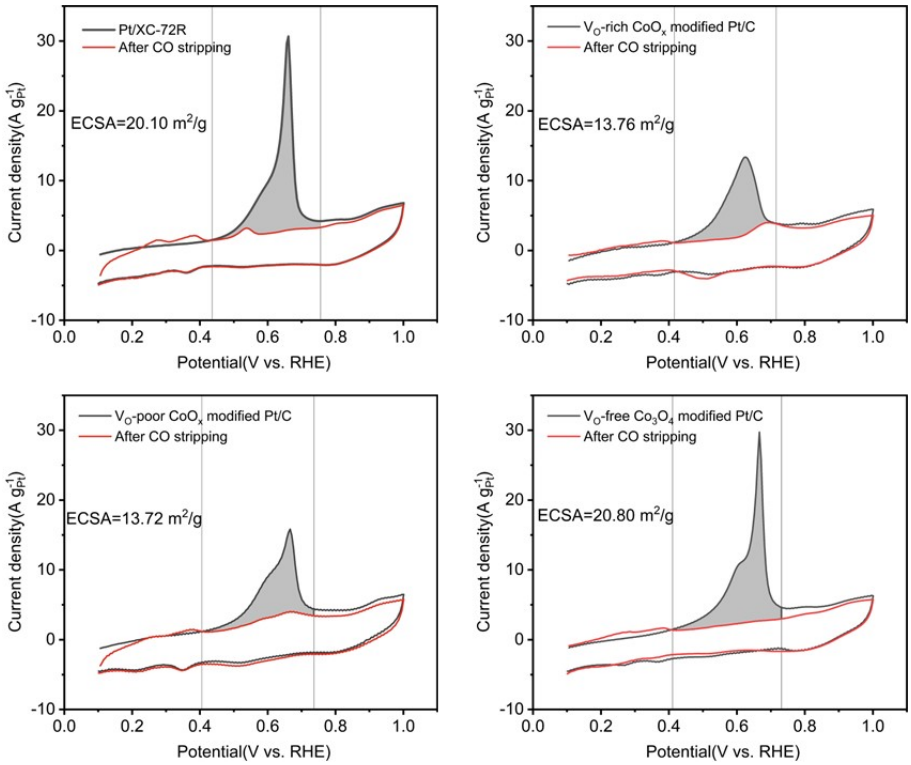


Figure. S6 CO stripping voltammograms for four catalysts.

Table. S2 ECSA of four catalysts via CO stripping voltammograms.

| | $S_{CO}/M_{Pt}$ (A V $g^{-1}$) | v (V $s^{-1}$) | ECSA ($m^2$ $g^{-1}$) |
|---|---|---|---|
| Pt/XC-72R | 1.69 | 0.02 | 20.10 |
| $V_O$-rich $CoO_x$ -modified Pt/C | 1.15 | 0.02 | 13.76 |
| $V_O$-poor $CoO_x$ -modified Pt/C | 1.15 | 0.02 | 16.72 |
| $V_O$-free $Co_3O_4$ -modified Pt/C | 1.77 | 0.02 | 20.80 |

Table. S3 Comparison of the AOR performances for Pt-based electrocatalysts in1 M KOH + 0.1 M $NH_3$ at 25 °C.

| Catalyst | Scan rate ($mV\ s^{-1}$) | Mass activity ($A\ g_{PGM}^{-1}$) | Specific activity ($mA\ cm^{-2}$) | Reference |
|---|---|---|---|---|
| $V_O$-rich $CoO_x$-modified Pt/C | 5 | 165 | 1.20 | This work |
| $Pt_7Ir_3$/XC-72 | 5 | 39 | N/A | [1] |
| $^{(100)}Pt_{85}Pd_{15}$/rGO | 5 | 165 | N/A | [2] |
| $Pt_7Co_2$-N-C | 5 | 74 | N/A | [3] |
| $Ni_7$-$Pt_{86}Mo_7$ | 5 | 95 | N/A | [4] |
| PtRuFeCoNi | 5 | 199 | 2.49 | [5] |
| $PtIrNi_1/SiO_2$-CNT-COOH | 5 | 124 | N/A | [6] |
| Pt/$CeO_x$-650 | 10 | 329 | N/A | [7] |
| PtZn-$Nb_2O_5$/C | 10 | 304 | N/A | [8] |
| PtCoSn/C | 10 | 238 | 0.87 | [9] |

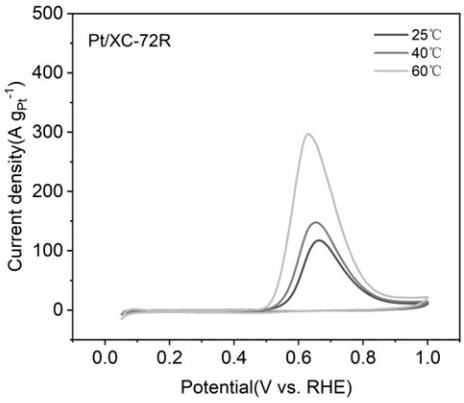


Figure. S7 CV tests of Pt/XC-72R at different temperatures.

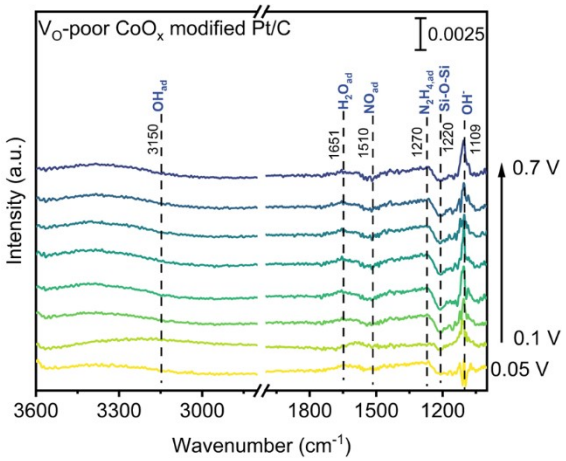


Figure. S8 *In-situ* FTIR spectra of $V_O$-poor $CoO_x$ modified Pt/XC-72R.

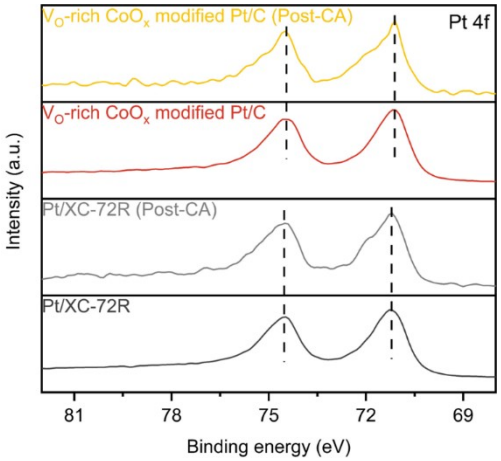


Figure. S9 Pt 4f XPS spectra of Pt/XC-72R and $V_O$-rich $CoO_x$ modified Pt/C pre and post-CA.

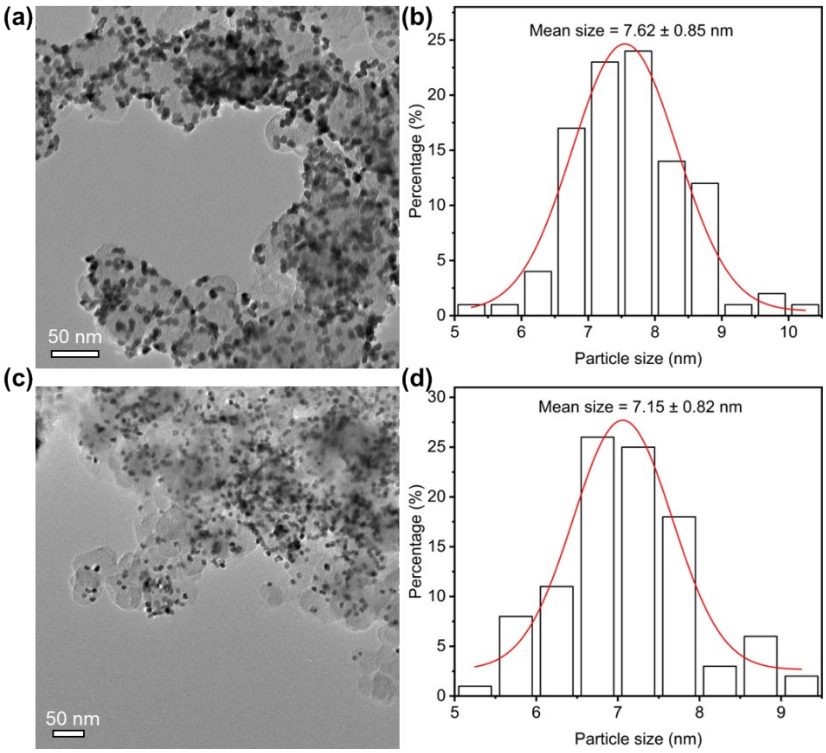


Figure. S10 TEM images of (a) Pt/XC-72R, (c) $V_O$-rich $CoO_x$ modified Pt/C and corresponding particle size distribution histograms of (b) Pt/XC-72R and (d) $V_O$-rich $CoO_x$ modified Pt/C post-CA tests

【Reference】


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