

Supporting Information

Revealing the Structural Transformation of Rutile RuO₂ via *In-Situ*

X-ray Absorption Spectroscopy during Oxygen Evolution Reaction

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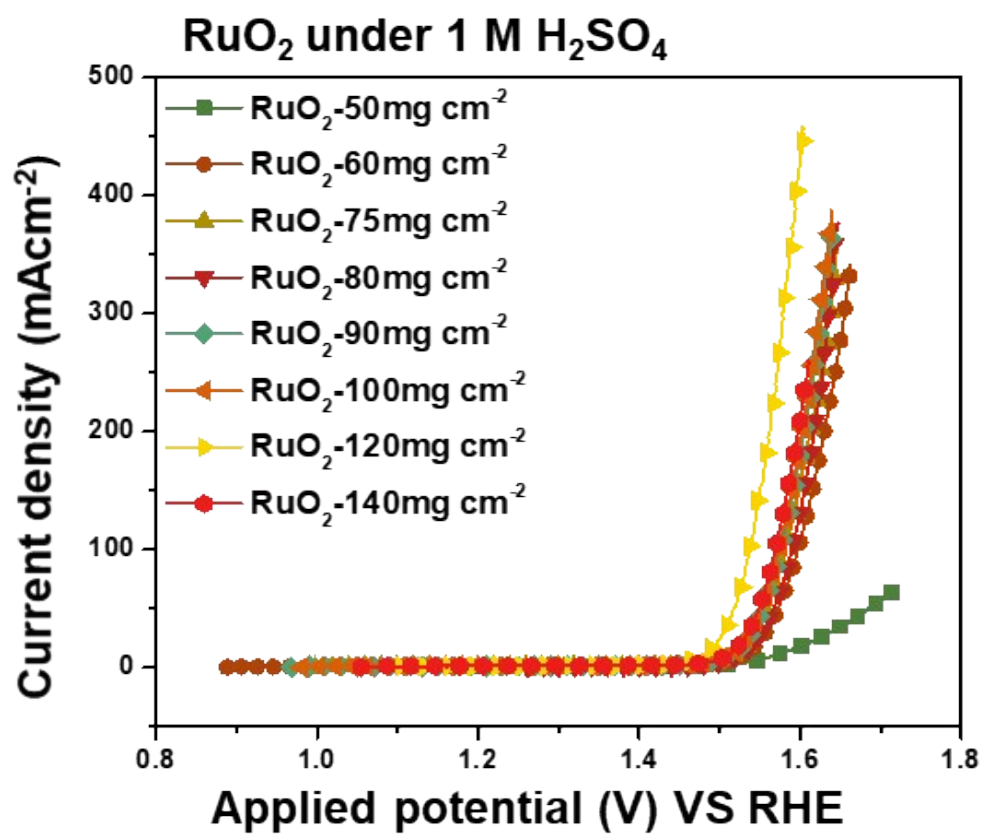


Fig. S1 LSV with different loading amount of RuO₂ under 1 M H₂SO₄.

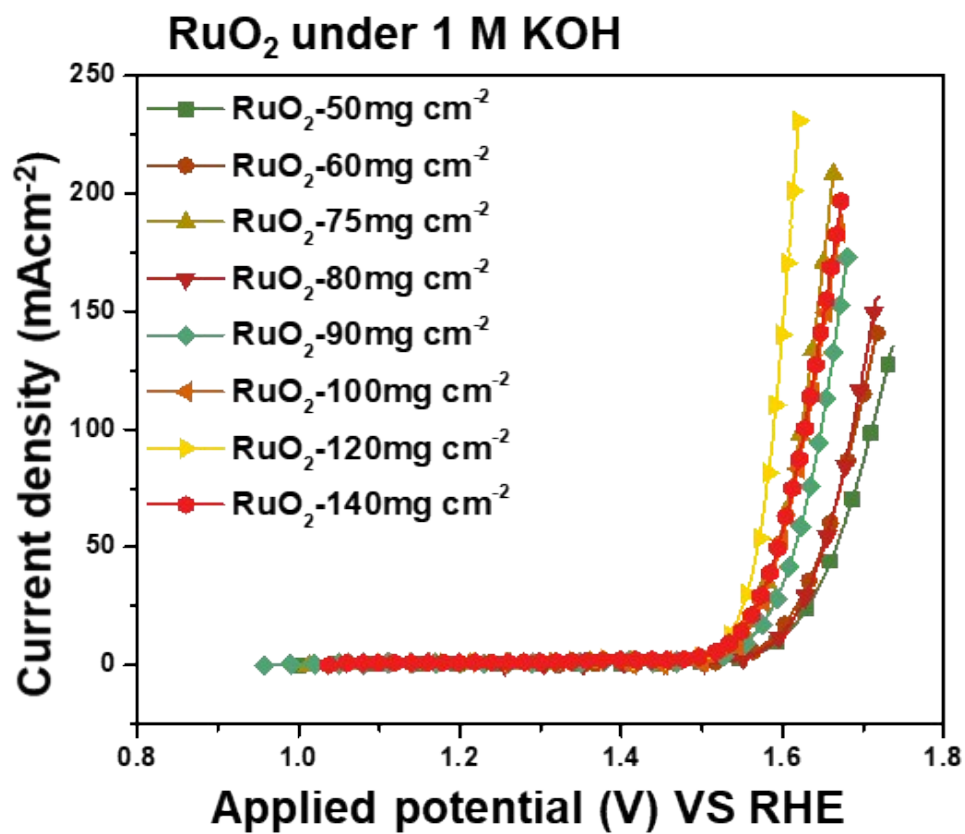


Fig. S2 LSV with different loading amount of RuO₂ under 1 M KOH.

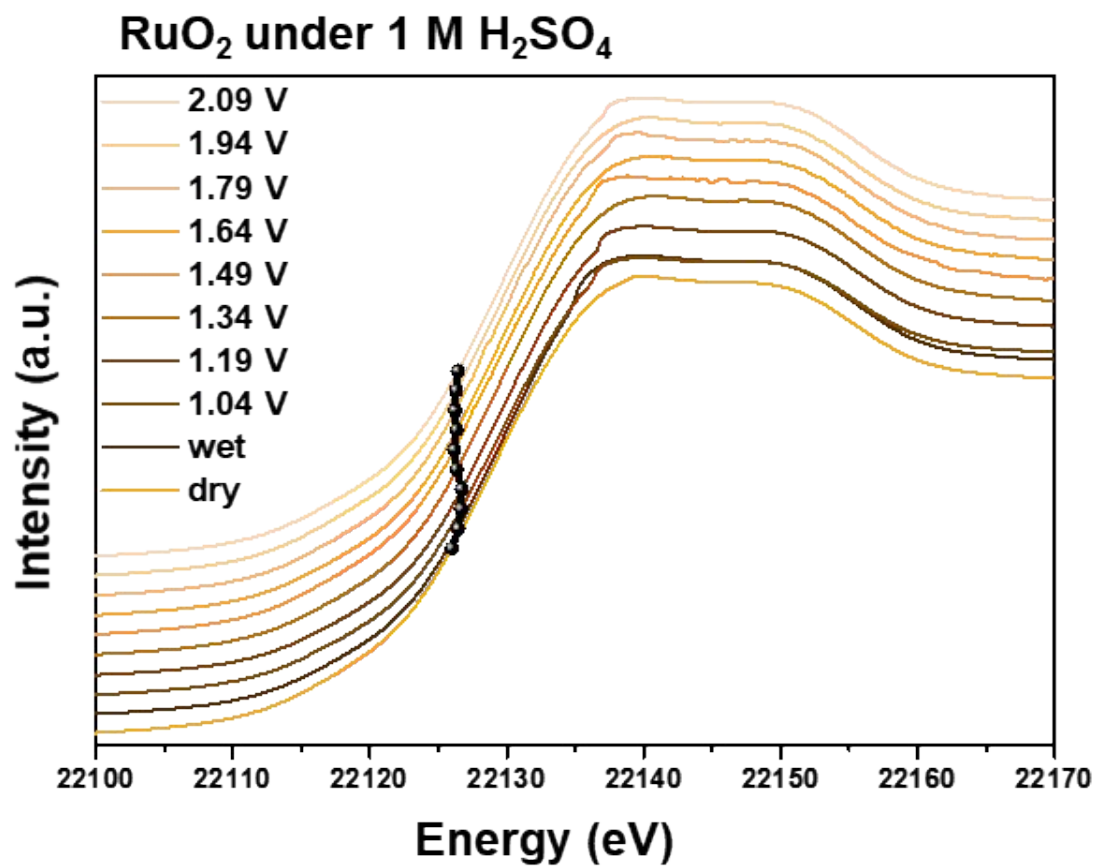


Fig. S3 *In-situ* K-edge XANES spectra of RuO₂ under 1 M H₂SO₄.

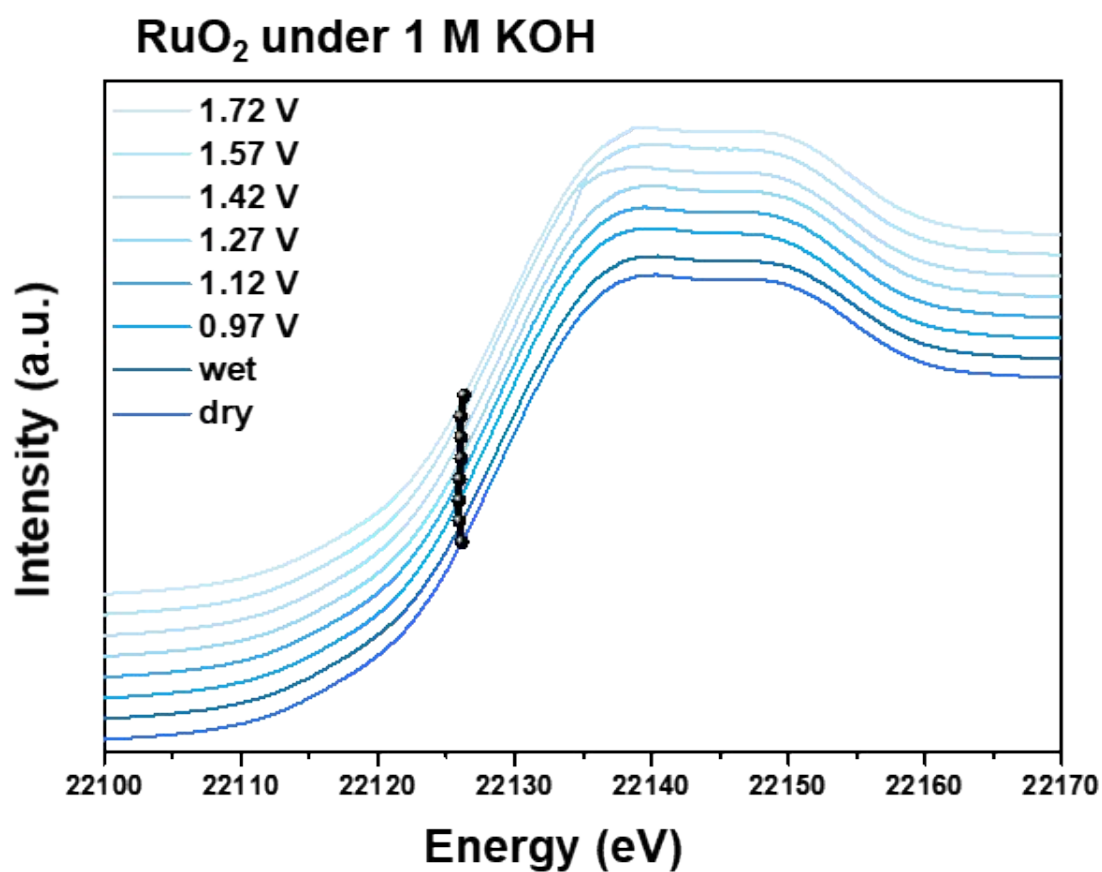


Fig. S4 *In-situ* K-edge XANES spectra of RuO₂ under 1 M KOH.

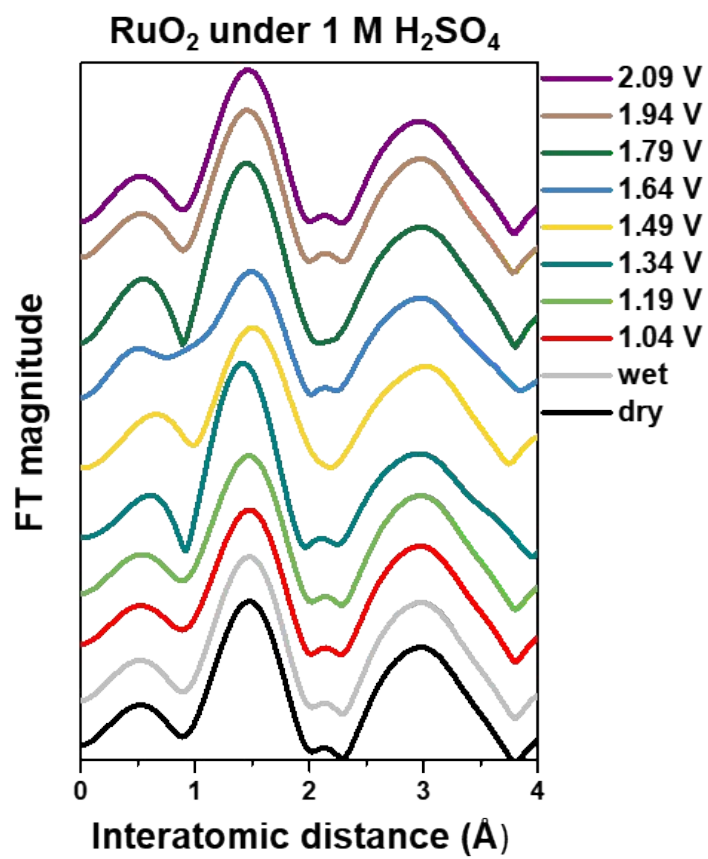


Fig. S5 *In-situ* EXAFS spectra of RuO₂ under 1 M H₂SO₄.

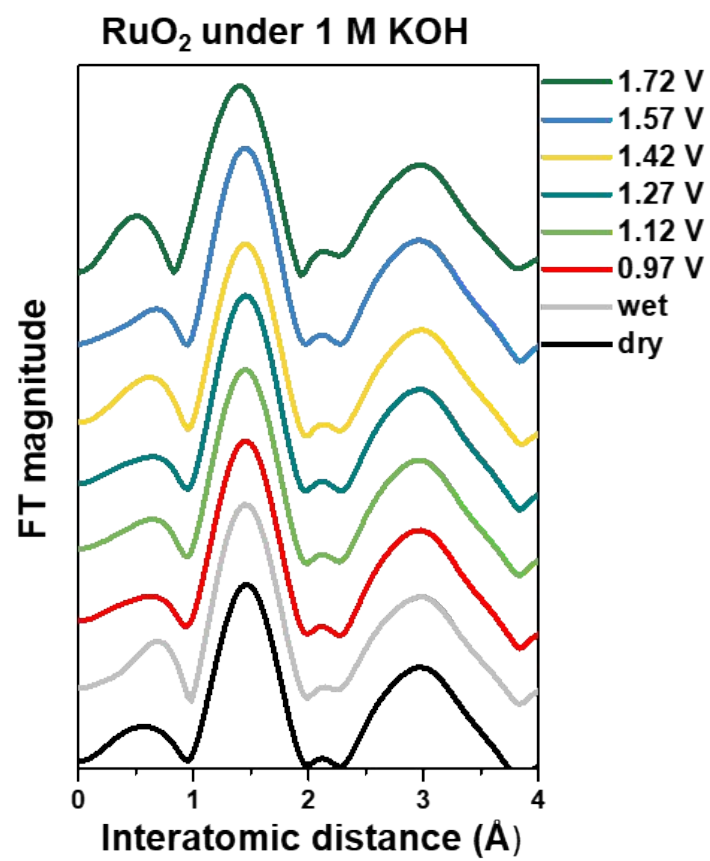


Fig. S6 *In-situ* EXAFS spectra of RuO₂ under 1 M KOH.

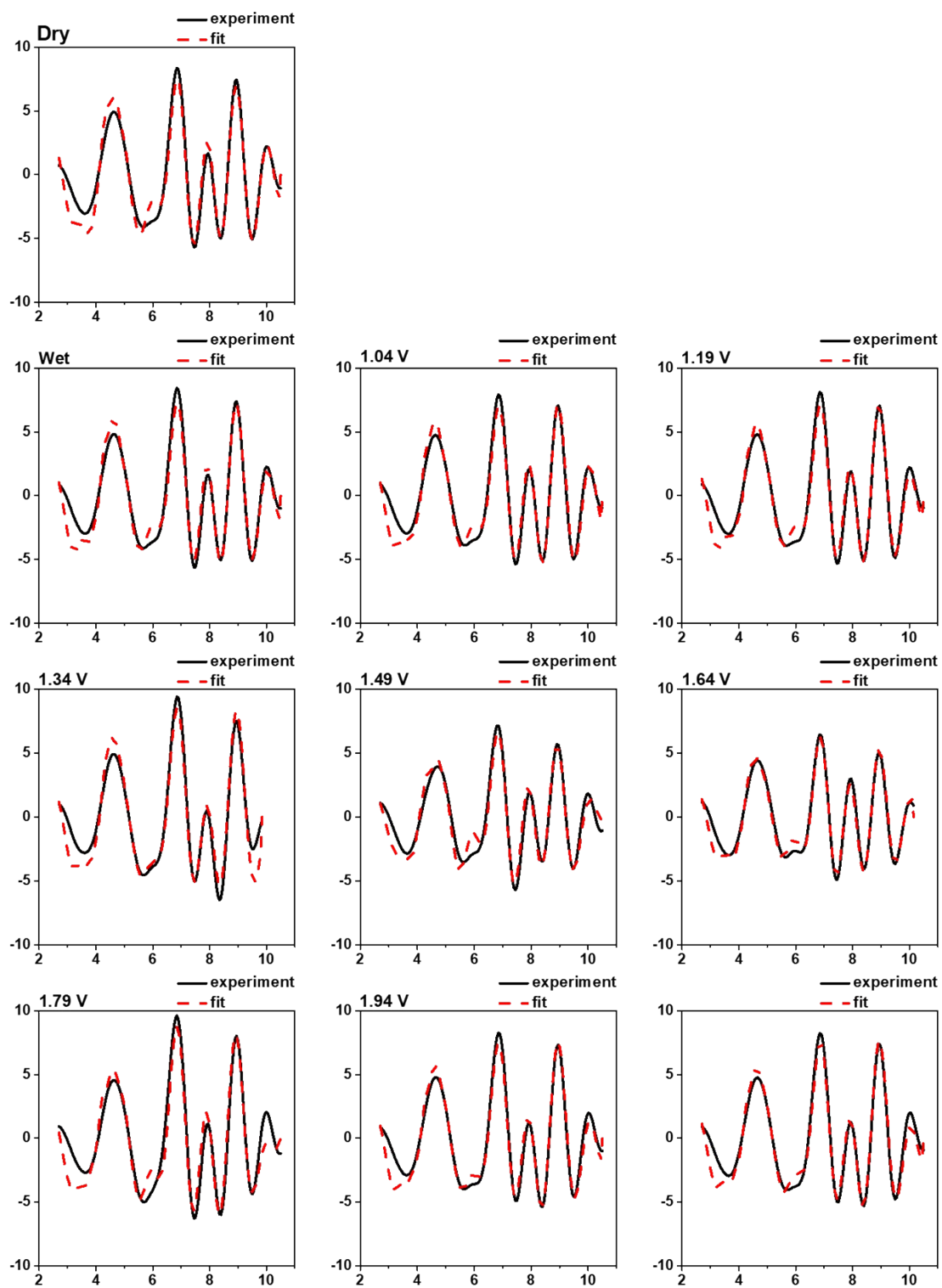


Fig. S7 K-space of the raw data and the fitting results in 1 M H₂SO₄ condition where Y axis represent $k^3 \chi(k) |A^{-3}|$ and X axis represent k (Å⁻¹), respectively.

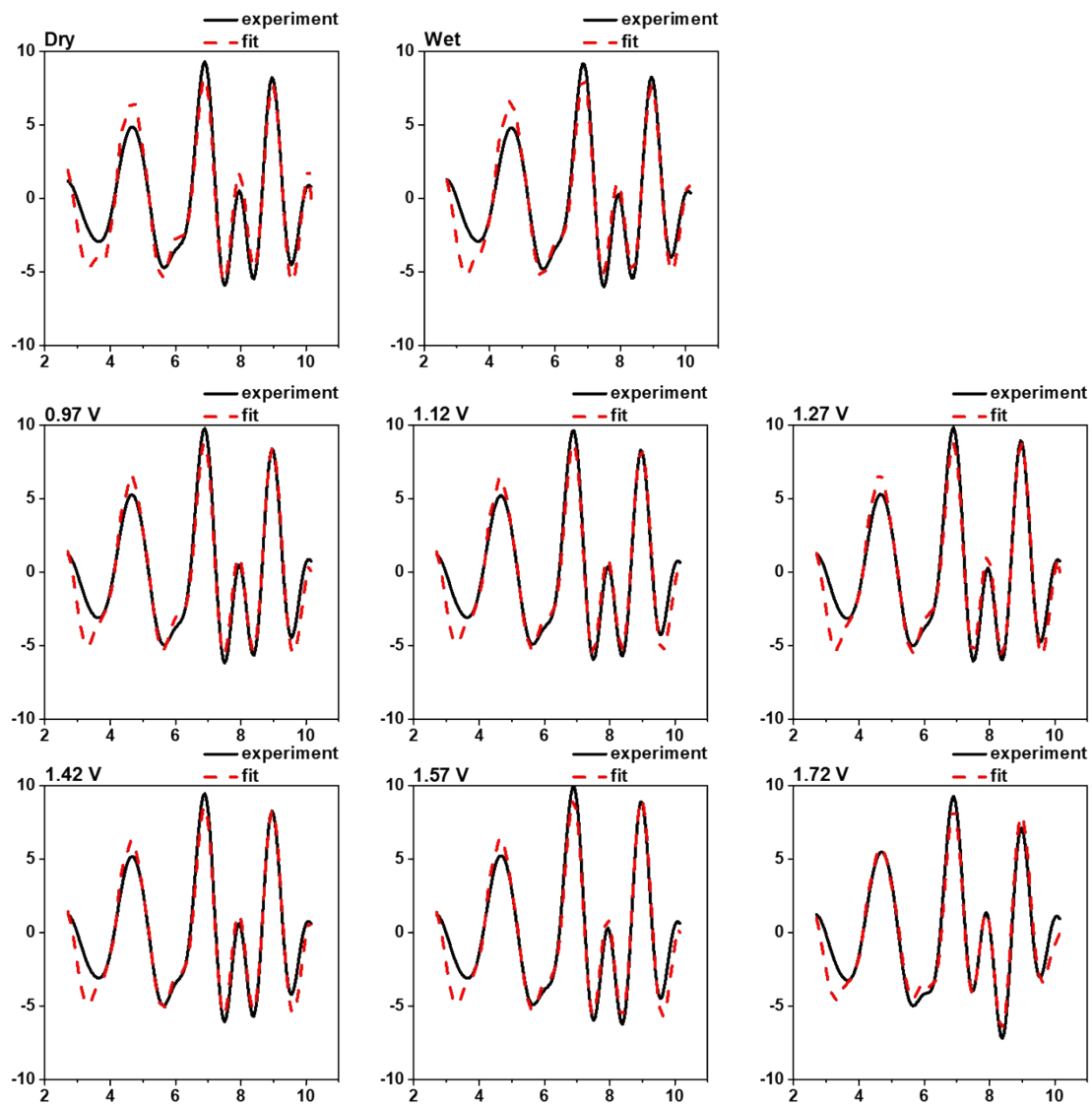


Fig. S8 K-space of the raw data and the fitting results in 1 M KOH condition where Y axis represent $k^3 \chi(k) |A^{-3}|$ and X axis represent k ($\text{\AA}^{-1}$), respectively.

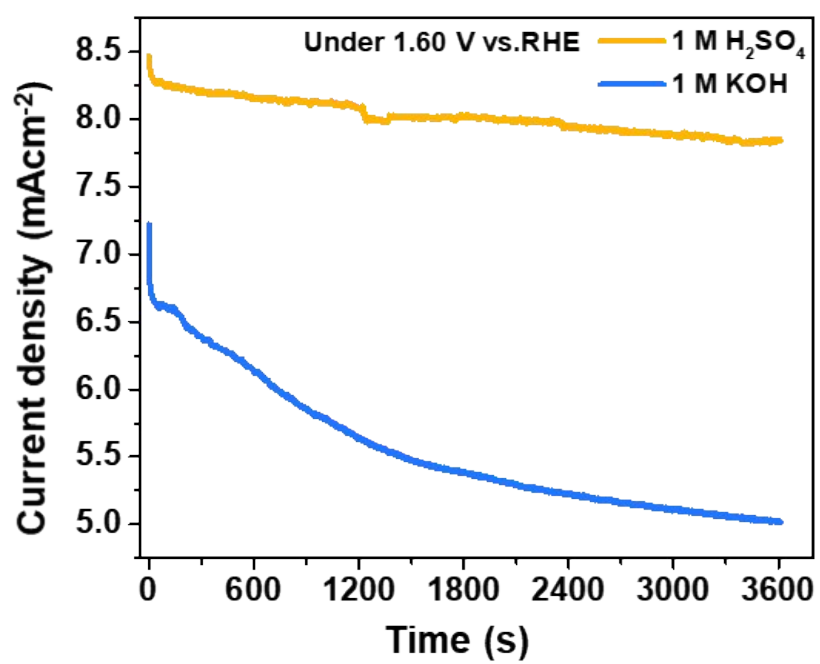


Fig. S9 Chronoamperometry measurement under 1.60V vs. RHE for both conditions.

RuO ₂ under 1 M H ₂ SO ₄				
Ru-O path Condition	N	R (Å)	ΔE (eV)	σ ² (Å ²)
Dry	5.6(2)	1.978(3)	-1.9(4)	0.0091(5)
Wet	5.0(2)	1.965(6)	-3.7(8)	0.0085(5)
1.04 (V) VS. RHE	4.7(2)	1.964(3)	-3.6(4)	0.0085(5)
1.19 (V) VS. RHE	4.4(1)	1.965(5)	-3.2(4)	0.0079(6)
1.34 (V) VS. RHE	4.3(1)	1.961(2)	-3.5(4)	0.0055(6)
1.49 (V) VS. RHE	4.2(2)	1.996(3)	-0.2(5)	0.0083(6)
1.64 (V) VS. RHE	4.2(2)	1.974(8)	-1.4(6)	0.0093(7)
1.79 (V) VS. RHE	4.1(1)	1.957(2)	-5.4(8)	0.0060(6)
1.94 (V) VS. RHE	4.2(1)	1.956(2)	-4.5(4)	0.0069(6)
2.09 (V) VS. RHE	4.0(1)	1.959(2)	-3.7(4)	0.0064(6)

Supplementary Table 1. Fitting parameters for RuO₂ under 1 M H₂SO₄.

RuO₂ under 1 M KOH

Ru-O path Condition	N	R (Å)	ΔE (eV)	σ² (Å²)
Dry	5.5(1)	1.974(4)	-1.3(3)	0.0078(4)
Wet	5.2(1)	1.962(2)	-3.9(8)	0.0072(5)
0.97 (V) VS. RHE	4.6(1)	1.961(4)	-3.5(7)	0.0058(5)
1.12 (V) VS. RHE	4.5(1)	1.961(4)	-3.5(8)	0.0055(5)
1.27 (V) VS. RHE	4.8(1)	1.956(2)	-4.2(4)	0.0061(5)
1.42 (V) VS. RHE	4.6(1)	1.963(2)	-3.3(8)	0.0061(5)
1.57 (V) VS. RHE	4.4(1)	1.957(4)	-3.6(7)	0.0051(7)
1.72 (V) VS. RHE	4.0(1)	1.933(2)	-5.9(8)	0.0055(6)

Supplementary Table 2. Fitting parameters for RuO₂ under 1 M KOH.