

Supporting information for:

Enhancing electrocatalytic activity of CoO for oxidation of 5-hydroxymethylfurfural by introducing oxygen vacancy

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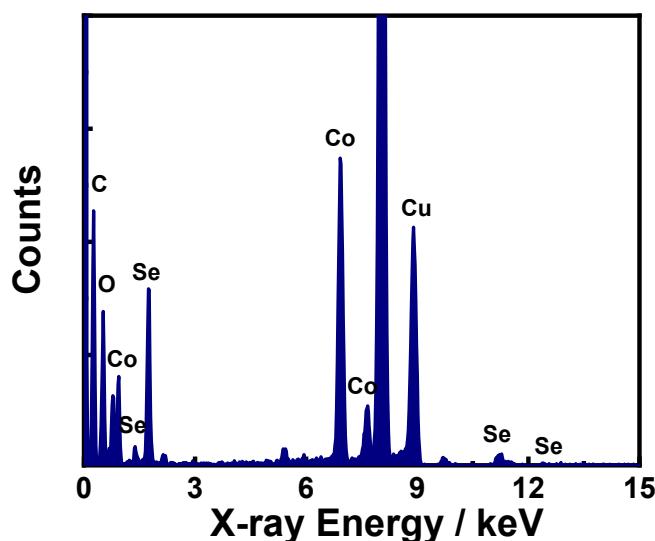


Fig. S1. The EDX spectrum of the as-prepared CoO/CoSe₂.

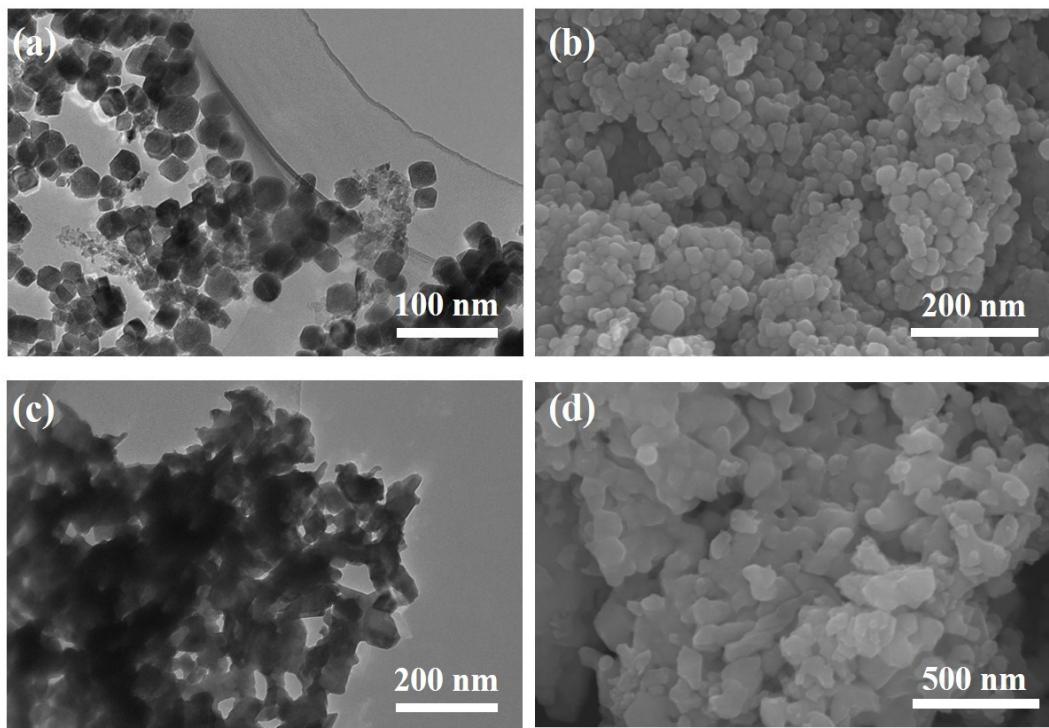


Fig. S2. TEM images for the prepared CoO (a) and CoSe₂ (c), and SEM images for the prepared CoO (b) and CoSe₂ (d).

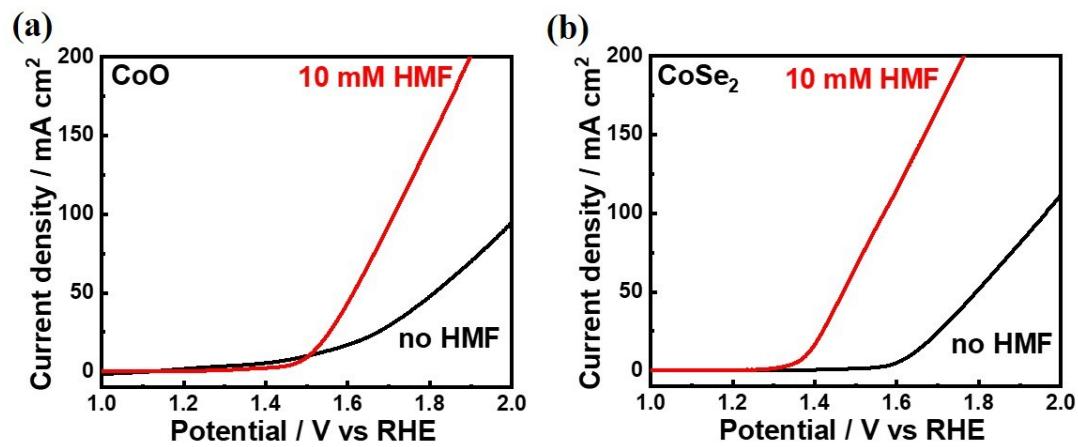
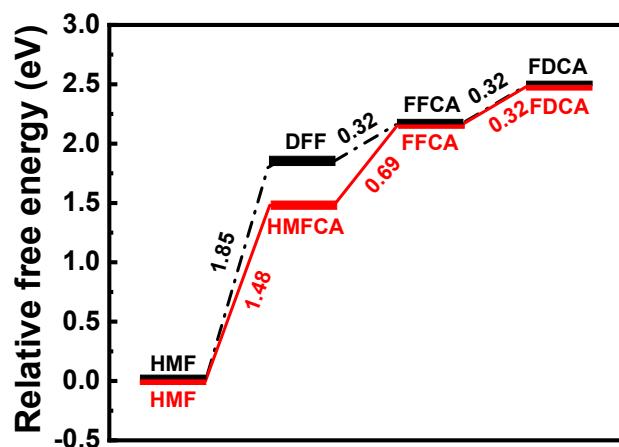


Fig. S3. LSV curves at a scan rate of 10 mV/s in 1 M of KOH with and without 10 mM HMF. (a) CoO and (b) CoSe₂.

Table S1. Electrochemical oxidation of HMF over various catalysts under different conditions.

Catalyst	Potential (V)	Reaction time (min)	HMF conversion (%)	FDCA yield (%)	FE (%)	TOF (min ⁻¹)
CoO-	1.43	57	100	99	97.9	2.74
CoSe ₂						
CoO-	1.33	220	91	90	99.0	0.65
CoSe ₂						
CoO-	1.53	35	100	96	69.8	4.47
CoSe ₂						
CoO	1.43	540	54	42	57.9	0.15
CoSe ₂	1.43	120	88	75	77.8	1.10

**Fig. S4.** The relative Gibbs free energy diagrams for HMF oxidation to FDCA in Path I and II.**Table S2.** Reaction rate of the electrochemical oxidation of HMF to FDCA over different catalysts.

Catalyst	Applied potential	Reaction rate (mmol·g ⁻¹ min ⁻¹)

CoO-CoSe ₂	1.43 V vs. RHE	36.6
CoO	1.43 V vs. RHE	2.0
CoSe ₂	1.43 V vs. RHE	14.7

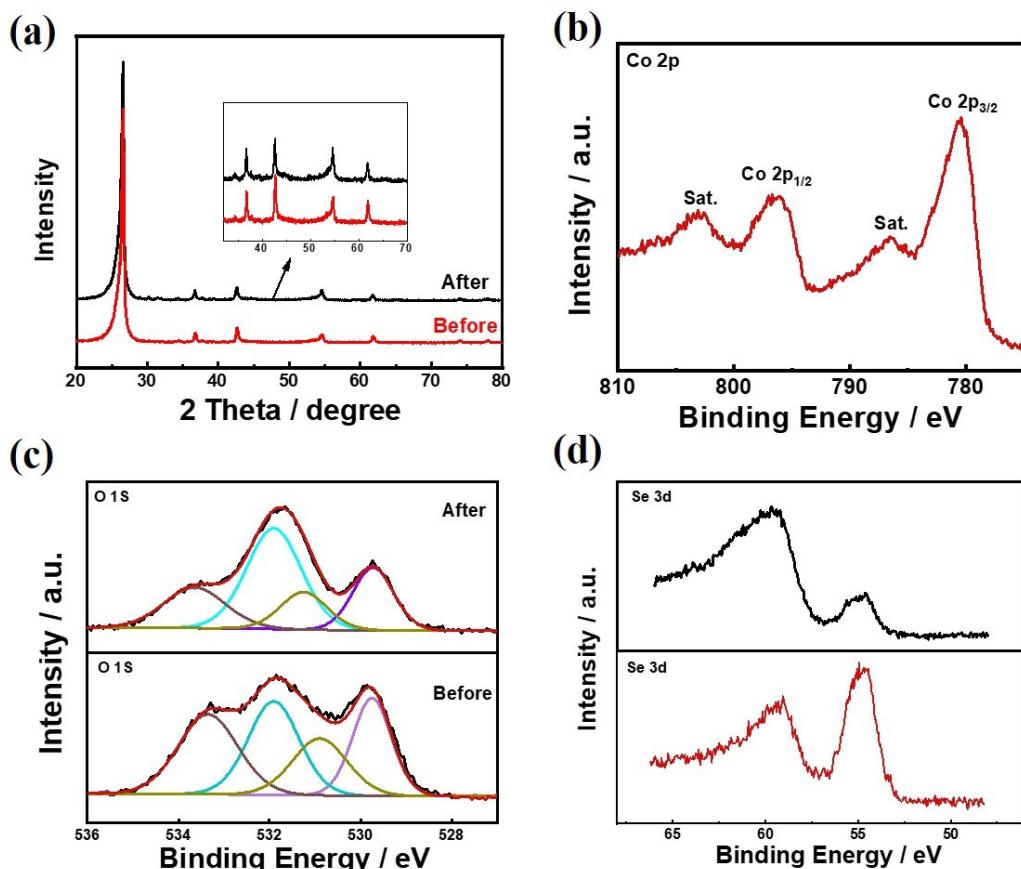


Fig. S5. XRD patterns and XPS spectra of the prepared CoO-CoSe₂ electrode before and after five electrolysis cycles. (b) XRD patterns, (b) Co 2p spectrum, (c) Se 3d spectrum, and (d) O1s spectrum of CoO-CoSe₂.

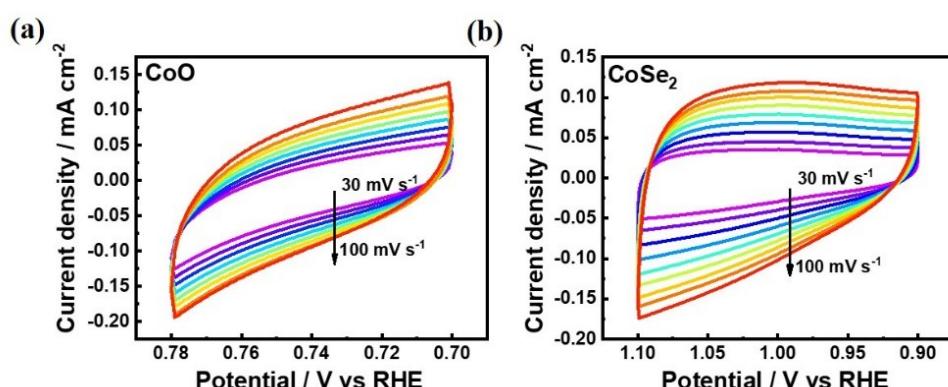


Fig. S6. CV curves in the presence of HMF at different scan rates with the range of 30-100 mV/s.
(a) CoO and (b) CoSe₂.