Supporting Information

Hydrous Cobalt-Iridium Oxide Two-Dimensional Nanoframes: Insights into Activity and Stability of Bimetallic Acidic Oxygen Evolution Electrocatalysts

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Figure S1. Scanning electron microscopy (SEM) image of Co(OH)₂:Ir showing the presence of pores within the nanosheet structure following Ir deposition.



Figure S2. High-angular dark-field scanning transmission electron microscopy (HAADF-STEM) images and corresponding energy dispersive x-ray spectroscopy (EDS) elemental mapping analysis of Ir (red) and Co (green) contents of CoIr-CL. The weight compositions were found to be 94.0 wt % Ir, 5.2 wt % Co, the remainder of 0.8 wt. % was attributed to oxygen.



Figure S3. X-ray photoelectron spectroscopy (XPS) average survey spectra of iridium-based catalysts; a) IrO₂ and b) CoIr-CL where, main core levels for Ir, Cl, C, N, O and Co are labeled. Survey spectra were normalized in intensity using the Ir4f peak maximum.

Table S1. Relative weight percentages determined from analysis of survey X-ray photoelectron spectra and energy dispersive x-ray spectroscopy (EDS) of iridium, cobalt and oxygen.

Sample		XPS		EDS			
	Elen	nent (w	t. %)	Element (wt. %)			
	Ir	0	Со	Ir	0	Со	
IrO ₂	81.0	18.9	-	84.5	15.4		
CoIr-CL	82.1	10.5	7.3	88.3	6.3	5.2	

Fitting of X-ray Photoelectron Spectra of Ir5p-Ir4f Region. After drawing on an extensive, but not exhaustive, literature review, it is clear that the analysis and interpretation of Ir4f region is as a complicated and demanding task.¹⁻¹³ Of the manuscripts that were reviewed, only three considered the simultaneous analysis of the Ir5p and Ir4f regions^{4,8,9} and, while in many

of the reports IrO₂-based materials are analyzed, the anomalously large peak height of the Ir4f_{5/2} component has only been indicated by Wertheim and Guggenheim,¹⁴ Kondintsev et al.,⁷ and Atanasoska et al.⁶ Lastly, despite the early prediction of unscreened satellite above the main line,¹⁴ of all the reviewed works only four considered the presence of this contribution as part of the Ir4f peak fitting.^{4,5,11,12}

The peak binding energies, relative peak areas, and basis for assignments of peaks within the Ir5p-Ir4f region from fitting analysis are shown in Table S2 and discussed below. The base peak model of the average Ir5p1/2-Ir4f high resolution spectra of the iridium-based catalysts, Figure S4A, considered an Ir5p and Ir4f splitting of 12.3 and 3.0 eV. It consisted of three main double spin-orbit Gaussian-Lorentzian contributions related to Ir-O, Ir-Cl and Ir-OH bonds. For the CoIr-CL sample, two additional double spin-orbit contributions allied to the asymmetric line shape associated with metallic Ir¹⁵ and Co2p region were needed. Within our analysis, we considered that the Ir4f asymmetric spectral envelope resulted from several overlapping symmetric peaks:¹⁶ (i) iridium chemical species (oxides, hydroxides and parental species), (ii) satellites of Ir (III) and Ir (IV), (iii) Ir5p_{1/2} peak and (iv) a Co3p peak (for the CoIr-CL sample). Additional models that considered the presence of asymmetries in the metal, oxide and hydroxide peaks show differences of the chemical species contents of less than 1.0% compared with the analysis used. The presence of two double Ir (IV) satellite and one double Ir (III) satellite features, labelled as Ir (IV) Sat I, Ir (IV) Sat II and Ir (III) Sat, respectively were considered (Figures S4A and S5). The satellites associated with Ir (IV) were placed at 1.3 and 5.2 ± 0.2 eV above the mainlines, respectively, while, the Ir (III) satellite was placed at 1.4 eV above the main peak.^{4,5,11,12} The peak fitting within the Ir5p-Ir4f region included peaks associated with Ir2O3; however, we note that formation of Ir2O3 remains under discussion.¹⁷

From the direct comparison of both iridium peaks within the IrO₂ and CoIr-CL samples, it is possible to clearly see a difference in the ratios between the Ir4f_{7/2} and the Ir4f_{5/2} components. The IrO₂ sample presents an anomalously large peak height for the Ir4f_{5/2} peak, while in the CoIr-CL sample the Ir 4f_{7/2} and the Ir 4f_{5/2} peaks present a 4:3 peak ratio. Also, the Ir4f_{5/2} region of the IrO₂ sample appears to be much broader than its counterpart in the CoIr-CL sample (Figure S4; fitted peaks in Table S2). In addition, the valley between Ir4f_{7/2} and Ir4f_{5/2} components is situated at a greater distance with respect to the baseline which implies two possible scenarios or the combination of both: 1) signals associated with final-state effect and/or 2) the presence of minor chemical species.

Fitting of X-ray Photoelectron Spectra of Ir5p region. Since the Ir5p_{1/2} component lies within the structure of the Ir4f spin-orbit doublet only one average signal with a binding energy (BE) located at approximately 60.8 eV is represented within the Ir4f region of Figure 6 (main text). In Figure S4B, the detailed peak fitting of average high-resolution spectra of the Ir5p region for IrO₂ and CoIr-CL samples are presented. From Figure S4B, it is possible to establish that more than one contribution is necessary to fit the Ir5p_{3/2} region. Therefore, an approximative fitting was carried out with the idea of estimating its footprint inside the Ir4f peak and its possible influence in its intensity and shape. Thus, the fitting considered three double main peaks, plus one in the case of the CoIr-CL sample; the presence of satellites features was not taken into consideration. After fitting, the iridium species corresponded to the assignment of metallic iridium (only present in CoIr-CL sample), Ir-O₂, Ir-Cl, and Ir-OH (oxide or oxyhydrate species); details are provided in Table S2. For both cases, the zone of region of the influence of the Ir5p_{1/2} signal in to the Ir4f region goes beyond 62.0 eV (Figure S4B).



Figure S4. High-resolution X-ray photoelectron average spectra and peak fitting of Ir5p-Ir4f region of IrO₂ and CoIr-CL samples where A) the full Ir5p-Ir4f range is shown and B) a zoomedin of the Ir5p region is presented that shows the Ir5p_{1/2} component lies within the structure of the Ir4f spin-orbit doublet and that the profile of Ir5p_{3/2} region provides evidence of the presence of different iridium chemical species.



Figure S5. High-resolution X-ray photoelectron average spectra and peak fitting of the Ir4f region of IrO₂ and CoIr-CL samples that shows satellite features of Ir(IV) and Ir(III and that the Ir5p_{1/2} component lies within the structure of the Ir4f spin-orbit doublet.

Fitting of X-ray Photoelectron Spectra of O1s Region. Peak fitting of the O1s region can be a challenging task because the binding energies of oxygen species related with O^{2-} , OH^{-} , O^{-} , and CO_{3}^{2-} are positioned very close to each other, and in multi-component systems distinguishing and correctly assigning different oxygen species can be difficult. Based on reports in the literature that indicate how the O1s peak outline is affected by adsorbed species of carbon and carbonates,¹⁸⁻²³ results obtained by XRD, and our experience, peak fitting of O1s high resolution spectra was performed to determine the presence and relative atomic percentages of oxygen surface species within the CoIr-CL and IrO₂ samples. The O1s peak region of the CoIr-CL and IrO₂ materials was fitted with a six Gaussian-Lorentzian contribution-based model plus an additional peak in the case of the CoIr-CL sample which was assigned to Co₃O₄. For fitting of the O1s region, the elements detected in the survey spectra (Figure S3), the Ir5p-Ir4f region peak fitting, and species associated with nitrate, isolated carbonyl-based functional groups, acids and esters were considered in the analysis. The peak binding energies, full width at half-maximum, relative peak areas, and basis for assignments of peaks within the O1s region from fitting analysis are shown in Table S3.

Fitting of X-ray Photoelectron Spectra of Co2p Region. Based on a similar analysis method to that used for the Ir4f region (described above), the Co2p peak fitting analysis took into account; 1) earlier reported binding energy data, 2) results from the O1s region peak fitting described above, 3) simultaneous analysis of both Co2p_{3/2} and Co2p_{1/2} regions, and 4) fitting approaches reported in early studies, as described below. The peak binding energies, relative peak areas and basis for assignments of peaks within the Co2p region from fitting analysis are shown in Table S4. During the fitting procedure, it was noticed that due to intense background noise and adjacent auger signals of the cobalt itself, the Co2p_{1/2} peak presented broadening and deformation

in its profile, and in consequence the peak ratio did not conform with the theoretical 1:2 peak ratio between $Co2p_{3/2}$ and $Co2p_{1/2}$ peaks. Consequently, it was estimated that for all main doublets a 1:4 peak ratio would allow a satisfactory fitting. Due to the presence of cobalt chemical species that correspond to Co (II) and Co (III), multiplets and satellite structures linked with these oxidation states were taken into account,²⁴⁻³² and the details corresponding to its position with respect to the main peak are presented in Table S4. Similarly, interference of Co LMN auger signals with $Co2p_{3/2}$ peak^{31,32} could induce a shift in the BE values. The $Co2p_{3/2}$ and $Co2p_{1/2}$ region of the CoIr-CL sample was adjusted by utilizing one Co LMN auger signal, three double main contributions with a spin-orbit splitting of 14.8 eV between, and the multiplets and satellite structures associated with them, as presented in Figure S6. One of the complex parts in the analysis of Co2p region is that, as is the case for all transition metals and their oxides, oxyhydroxides and hydroxides, the presence of multiplet splitting, shake-up and plasmon loss structures make the fitting process an arduous and complicated task. Based on these factors, it was necessary to add the presence of the Auger signals of the cobalt itself, some of which are inside the $Co2p_{3/2}$ peak and the others contribute or induce deformation of the region of the $Co2p_{1/2}$ peak, as can be seen in Figure S6. The utilized fitting model considered the presence of three double main Gaussian-Lorentzian contributions plus the multiplet and satellite structures that can be observed in Figures S6 and S7.

From the Co2p region fitting analysis, the presence of metallic cobalt was verified by the high intensity peak located around 778.2 ± 0.2 eV which is consistent with early reported binding energy (BE) values²⁸⁻³³ and in good agreement with XRD data and the SAED pattern obtained by STEM. The presence of CoO cannot be clearly determined, but as indicated for O1s, it could be present as a minority or residual species. Figures S6 and S7 show the Co2p high resolution spectra

of two batches of the CoIr-CL catalyst, labelled as CoIr-CL-1 and CoIr-CL-2 which indicated that between batches of the same sample there were changes in the atomic percentage content but not in the specific chemical species at the surface. It is important to notice that these little differences in the atomic ratio did not show an appreciable influence in the electrochemical properties beyond statistical error. The fitting parameters for both samples are given in Table S4.



Figure S6. High-resolution X-ray photoelectron average spectra and peak fitting of Co2p region of two CoIr-CL samples, labelled as CoIr-CL-1 and CoIr-CL-2, are shown. The figure shows i) the presence of different cobalt oxide, hydroxide and/or oxyhydroxide species can be observed and, ii) multiplet and satellite peaks are clearly observed.



Figure S7. High-resolution X-ray photoelectron average spectra and peak fitting of the Co2p region two CoIr-CL samples, labelled as CoIr-CL-1 and CoIr-CL-2, that shows multiplet and satellite peaks of Co₁, Co₂ and Co₃ species.

		Thi	s work			Literature				
Sample	*BE	FWHM	**Area	Label	BE [eV]	Allocated species	Reference			
	[± 0.1 eV]	[eV]	[at%]							
	49.0	3.42	43.2	Ir5p	48.0 50.2		489			
	61.4	1.1	29.8	Ir1	48.0 - 30.2	IISP) IISP _{3/2}				
	62.3	1.2	14.2	Ir2	59.0 61.1	Co3p) Metal, oxide and hydroxide	33-35			
IrO ₂	63.5	1.3	12.8	Ir3	58.9 - 01.1	range				
	Ir1+1.3	1.2	-	Ir (IV) Sat I	60.2 60.0	LON Madallia inidiana	1.3.4.6-8.10.11.36			
	Ir1+5.2	1.3	-	Ir (IV) Sat II	00.3 - 00.9	ii) Wetanie indium				
	Ir3+1.2	1.4	-	Ir (III) Sat	61 2 62 7	Ir1) IrO	1-6,8,10-12,37-39			
					01.2 - 02.7	11) 1102,				
	48.5	2.9	33.8	Ir5p	62.2 - 62.7	Ir2) Ir ₂ O ₃ , IrCl ₃ xH ₂ O, IrCl _x and/or IrCl ₃	1,2,4,5,11,12,36,37,40			
	59.6	1.7	23.8	Co3p	(2.5	L2) L. OII (inidium hudrous)	4637			
	60.9	0.9	24.3	Ir ⁰	02.5	IF3) IF-OH (IFIdium hydroxo)	.,			
CoIr-CL	61.6	1.1	10.5	Ir1	62 8 62 2+	In (IVI) Set I	4,5,11,12			
	62.5	1.2	4.2	Ir2	62.8 - 63.2‡	If (IV) Sat I				
	63.4	1.3	3.4	Ir3	(7,9) $(7,0+$		11.12			
	Ir1+1.3	1.0	-	Ir (IV) Sat I	07.8 - 07.9	If (IV) Sat II	,			
	Ir1+5.2	1.1	-	Ir (IV) Sat II	63.3 - 63.4§	In (III) Set	11.12			
	Ir2+1.2	1.4	-	Ir (III) Sat		11 (111) Säl	,			

Table S2. Details of the peak fitting analysis of high resolution X-ray photoelectron spectra within the Ir5p-Ir4f region of commercial IrO₂ and CoIr-CL samples including Binding Energy (BE), FHWM (Full Width at Half-Maximum), relative areas, labels, assigned species and supporting literature references.

*The BE values corresponds to $Ir4f_{7/2}$ peak. $\ddagger \sim 1.1$ **Average content of six point $\ddagger \sim 6.1$

 $\ddagger \sim 1.1 \text{ eV}$ above the main line of Ir4f_{7/2}, Ir(IV) $\ddagger \sim 6.1 \text{ eV}$ above the main line of Ir4f_{7/2}, Ir(IV) ~1.0 eV above the main line of Ir4f_{7/2}, Ir(III)

Table S3. Details of the peak fitting analysis of high resolution X-ray photoelectron spectra within the O1s region of commercial IrO₂ and CoIr-CL samples including Binding Energy (BE), FHWM (Full Width at Half-Maximum), relative areas, labels, assigned species and supporting literature references.

		This w	vork		Literature					
Sample	BE [± 0.1 eV]	FWHM [eV]	Area [at%]	Label	BE [eV]	Allocated species	Reference			
	529.8	1.55	32.4	IrO ₂	500 1 500 7		18 24 26 33 41			
	530.8	1.56	27.9	O1	529.1 - 529.7	$Co(Ox)$) COO and/or Co_3O_4	10,24 20,33,41			
1-0	531.6	1.63	19.8	O2	520 6 520 1		1 5 28 33 37 39 42			
1102	532.4	1.70	13.7	O 3	529.6 - 530.1	IrO_2) IrO_2 , Co_2O_3	1-3,20,33,37,37,42			
	533.6	1.78	5.0	O4	520 5 521 4	(2) (2) (2) (2) (2) (2) (2) (2)	1 5 18 22 28 22 27 20 41 42			
	534.9	1.33	1.1	O5	530.5 - 531.4	O1) Ir ₂ O ₃ , Co(OH) ₂ , CO ₃ , M_x (CO ₃) _y	1-3,10-22,20,33,37,37,41-43			
	529.4	1.33	7.5	Co(Ox)	- 531.5 - 531.9	O2) Ir(OH)3, IrO(OH)2, Ir-OH (iridium hydroxo)	2-5,27,37,39,42			
	529.9	1.34	25.8	IrO ₂			4 19 22 44 46			
	530.9	1.40	23.9	O 1	532.6 - 533.0	O3) IrCl ₃ xH ₂ O, ClO ₃ -, C-OH, C-O-C,	4,18,23,44-46			
CoIr-CL-L	531.5	1.47	17.5	O2			1 0 4 5 18 27 20 40 45 47			
	532.3	1.53	14.5	O3	533.2 - 533.5	O4) NO ₃ -, O=C-O, OH (ads)	1,2,4,3,18,3/,39,42,43-4/			
	533.6	1.60	8.9	O 4	524.0 525.2		45,46,48			
	535.2	1.66	1.9	O5	534.9 - 535.3	05) -COO-, C=O, O-C(=O)-O				

Table S4. Details of the peak fitting analysis of high resolution X-ray photoelectron spectra within the Co2p region of two batches of the CoIr-CL catalyst, labelled as CoIr-CL-1 and CoIr-CL-2, including Binding Energy (BE), FHWM (Full Width at Half-Maximum), relative areas, labels, assigned species and supporting literature references.

This work					Literature					
Sample	BE [± 0.1 eV]	FWHM [eV]	Area [at%]	Label	BE [eV]	Allocated species	Reference			
	776.9	2.75	5.9	Co lvv	776 0 780 2	Course) Co Augor LaMa Machine	31.32			
	778.2	1.02	26.9	Co1	//0.0 - /80.2	CO LMM) CO Auger L3M23M45 transition	51,52			
	Co1+3.4	2.51	-	Sat I	779 0 779 1	Col) Motallia appalt	29,30,33			
	Co1+5.6	2.76	-	Sat II	//8.0 = //8.1	Cor) Metanic cobait				
	779.1	1.30	17.1	Co2	701 1	Set I) 1st Matellie askelt setallite	30			
	Co2+2.3	1.57	-	Mult I	/81.1	Sat I) 1 th Metallic cobalt satellite				
CoIr-CL-1	Co2+3.3	1.57	-	Mult II	792 1	Set II) 2nd Matallia ashalt satellita	30			
	Co2+6.2	2.00	-	Sat I	/85.1	Sat II) 2 Metanic cobait satellite				
	Co2+10.2	2.47	-	Sat II	770 5 770 9		25.28-31.49			
	780.0	1.92	50.1	Co3	//8.3 = //9.8	02) 0304				
	Co3+3.3	2.4	-	Mult I	780.9	Mult I) 1st Co ₃ O ₄ multiplet	30			
	Co3+7.2	2.64	-	Sat I			30			
	Co3+11.8	2.79	-	Sat II	782.2	Mult II) 2nd Co ₃ O ₄ multiplet				
	776.9	2.75	7.1	Co lvv			28,30			
	778.2	1.02	35.8	Co1	/82.2, /8/.1	Sat I) 1 st Co ₃ O satellite				
	Co1+3.4	2.52	-	Sat I	795.0		30			
	Co1+5.6	2.77	-	Sat II	785.2	Sat II) 2 nd Co ₃ O satellite				
	779.1	1.29	21.8	Co2	790.0 791.0		28-30 33			
	Co2+2.3	1.67	-	Mult I	/80.0 - /81.0	C03) C00, C000H, C0(0H) ₂	20 00,00			
CoIr-CL-2	Co2+3.3	1.77	-	Mult II	791 4 792 2	1st C- (OII)ltiplet	30			
	Co2+6.2	2.44	-	Sat I	/81.4 - /82.2	1 st Co(OH) ₂ multiplet	50			
	Co2+10.2	2.91	-	Sat II	792 1 796 0		30			
	780.2	1.80	35.3	Co3	/85.1 - /86.0	Sat 1) 1 Co(OH)2 satellite	20			
	Co3+3.3	2.69	-	Mult I			30			
	Co3+7.2	2.98	-	Sat I	786.5 - 790.4	Sat II) 2 nd Co(OH) ₂ satellite				
	Co3+11.8	3.23	-	Sat II						



Figure S8. Comparison of the cyclic voltammetry (CV) before and after ADT of CoIr-CL (A) and IrO₂ (B); scans shown after Au-disk background correction of CoIr-CL_{EO} before and after accelerated durability testing were used to determine pseudocapacitive charge; pseudocapacitive charge was determined using the oxidation scan.



Figure S9. Scanning electron microscopy (SEM) images of postmortem CoIr-CL_{ADT} after durability test. Three main regions were detected associated to different processes: A) small nanoparticles due to the partial breakdown of the 2D structure; B) collapse of 2D structure and formation of agglomerates; and C) retention of 2D structure; (D) energy-dispersive x-ray spectroscopy (EDS) spectrum (center) and mapping of Co and Ir (left) which shows iridium and cobalt distributed within the material after ADT.

Table S5. Comparison of electrochemical surface areas (ECSA), oxygen evolution reaction (OER) mass activities, and OER specific activities of IrO₂-AA (Alfa Aesar) and CoIr-CL. The OER mass activities were normalized for the mass of Ir and were determined at 1.51 V_{RHE} and 1.55 V_{RHE} from chronoamperometry measurements. Data obtained before (initial) and after accelerated durability testing (ADT) is included. Percent of initial and final OER mass activities were determined by the ratios of the mass activities at 1.51 V_{RHE} before and after ADT. Data from a previous study of IrO₂¹³ tested using identical conditions was included for comparison. Mass activities considered dissolution of iridium, as discussed in the text.

Value	Parameter (units)	IrO ₂ -AA ¹³	CoIr-CL	
Nominal electrode loading	Loading ($\mu g_{Ir} cm^{-2}_{geo}$)	11.6	15.3	
Electrochemical surface area of iridium (ECSA _{Ir}), initial	$ECSA_{Ir,CO} (m^2 g^{-1})$	_	61.2 ± 3.12	
Electrochemical surface area of IrO ₂ (ECSA _{IrO2}), after electrochemical oxidation	$\mathrm{ECSA}_{\mathrm{IrO2}}(\mathrm{m}^2\mathrm{g}^{\text{-1}})$	25 ± 1.5	30 ± 5	
	$J_{geo}^{1.51V}$ (mA cm ⁻² _{geo})	0.17 ± 0.03	3.0 ± 1.2	
	$J_m^{1.51V}(A g_{Ir}^{-1})$	13.9 ± 1.4	243 ± 47	
	$J_{s}^{1.51V}$ (mA cm ⁻² _{IrO2})	0.045 ± 0.005	0.80 ± 0.02	
Initial OER activity	$J_{geo}^{1.55V}$ (mA cm ⁻² _{geo})	1.04 ± 0.3	14.4 ± 1.2	
	$J_m^{1.55V}(A g_{Ir}^{-1})$	90 ± 26	971 ± 78	
	$J_{s}^{1.55V}$ (mA cm ⁻² _{IrO2})	0.31 ± 0.10	2.6 ± 0.6	
Electrochemical surface area of IrO ₂ (ECSA _{IrO2}), after ADT	$ECSA_{IrO2} (m^2 g^{-1})$	22.5 ± 1.2	22 ± 4	
	$J_{geo}^{1.51V}$ (mA cm ⁻² _{geo})	0.12 ± 0.009	2.4 ± 0.3	
	$J_m^{1.51V}(A g_{Ir}^{-1})$	11.7 ± 1.7	192 ± 4	
Final OER activity, After	$J_{s}^{1.51V}$ (mA cm ⁻² IrO2)	0.042 ± 0.005	0.83 ± 0.08	
Durability Testing (1.6 V)	$J_{geo}^{1.55V}$ (mA cm ⁻² _{geo})	0.68 ± 0.1	12.8 ± 1.0	
	$J_m^{1.55V}(A g_{Ir}^{-1})$	66 ± 11	919 ± 54	
	$J_{s}^{1.55V}$ (mA cm ⁻² IrO2)	0.29 ± 0.03	3.3 ± 0.8	
Percent OER mass activity	ADT $J_m^{1.51V}$ / Initial $J_m^{1.51V}$ (%)	84 ± 7	79 ± 9	
(Final/Initial)	ADT $J_m^{1.55V}$ / Initial $J_m^{1.55V}$ (%)	66 ± 9	94 ± 2	

Table S6. Comparison of oxygen evolution reaction (OER) activities for electrocatalyst tested in this study and previously reported values; OER mass activities (normalized for mass of Ir) at 1.51 V_{RHE} and 1.55 V_{RHE} ; overpotential (η) vs RHE at current densities of 10 mA cm⁻² and 0.5 mA cm⁻² (normalized with respect to geometric area of the electrode); details on the support material, loading, and experimental details of the measurements are included.

Material	Support material	Loading (µgIr cm ⁻² geo)	Im ^{1.51V} (A g _{Ir} -1)	Im ^{1.55V} (A g _{Ir} ⁻¹)	η vs RHE, 0.5 mA cm ⁻²	η vs RHE, 10 mA cm ⁻²	Tafel slope (mV dec ⁻¹)	Ref.
CoIr-CL ^(a)	None	18.8	243 ± 47	971 ± 78	0.23	0.29	40 ± 4	This work
IrO ₂ -AA ^(a)	None	11.7	13.9 ± 1.4	90 ± 26	0.27	0.36	37 ± 3	13
IrCo/C ^(b)	Carbon	10.0	-	-	-	~0.30	76.9	50
IrCoNi/C ^(b)	Carbon	10.0	-	-	-	0.303	53.8	
$\begin{array}{c} \text{leached-} \\ \text{Ir}_{0.7}\text{Co}_{0.3}\text{O}_x{}^{(c)} \end{array}$	None	102	-	-	0.26	~0.32	40	51
CoIr nanowires ^(d)	None	30.6	594	2327	-	-	-	52

(a) Chronoamperometry, Argon-saturated 0.1 M HClO₄, 2500 rpm, iR-corrected

(b) Linear sweep voltammetry, O_2 -saturated 0.1 M HClO₄, 0 rpm, scan rate of 5 mV s⁻¹, 95% iR-corrected

(c) Linear sweep voltammetry, O₂-saturated 0.5 M H₂SO₄, 1600 rpm, scan rate of 5 mV s⁻¹, no iR-correction

(d) Linear sweep voltammetry, Argon-saturated 0.1 M HClO₄, 2500 rpm, scan rate of 20 mVs⁻¹, iR-corrected

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