Electronic Supplementary Material (ESI) for New Journal of Chemistry.

ELECTRONIC SUPPORTING INFORMATION

New Heteroleptic bis-(diphenylphosphino)ethane appended dialkyldithiophosphatecobalt(III) cations: Apt electrocatalysts for heterogeneous OER and homogeneous HER

Devyani Srivastava,[a] Omoding Daniel,[a] Aparna Kushwaha,[a] Gabriele Kociok-Köhn,[b] Suresh W. Gosavi,[c] Ratna Chauhan,[d] Mohd. Muddassir,[e] and Abhinav Kumar [a]*

[a.] *Department of Chemistry, Faculty of Science, University of Lucknow, Lucknow 226 007, India. Email: abhinavmarshal@gmail.com*

[b.] *Materials and Chemical Characterisation Facility (MC²), University of Bath, Claverton Down, Bath, BA2 7AY, UK.*

[c.] *Department of Physics, Savitribai Phule Pune University, Pune-411007, India.*

[d.] *Department of Environmental Science, Savitribai Phule Pune University, Pune-411007, India.*

[e.] *Department of Chemistry, College of Sciences, King Saud University, Riyadh 11451, Saudi Arabia*

ELECTRONIC SUPPORTING INFORMATION

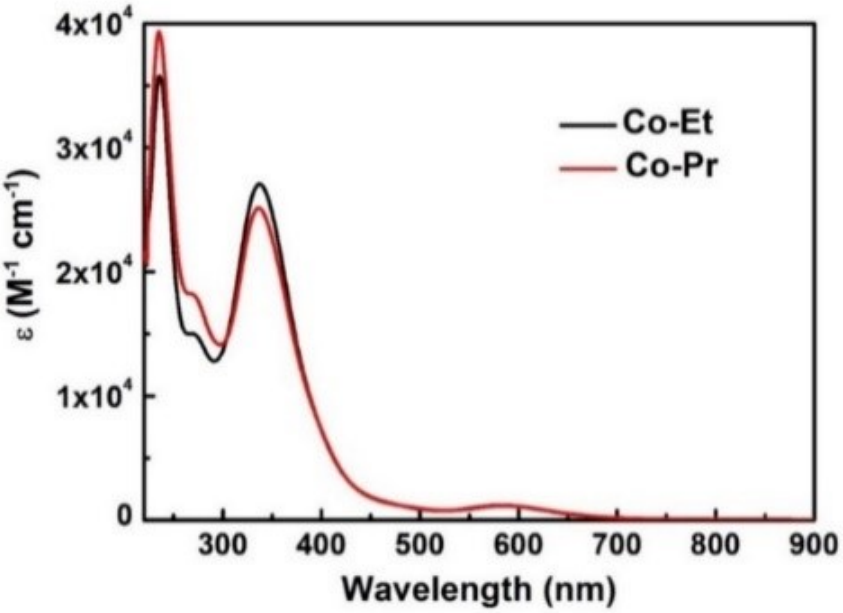

Fig. S1 Electronic absorption spectrum of **Co-Et** and **Co-Pr** in 1×10^{-4} M dichloromethane solution.

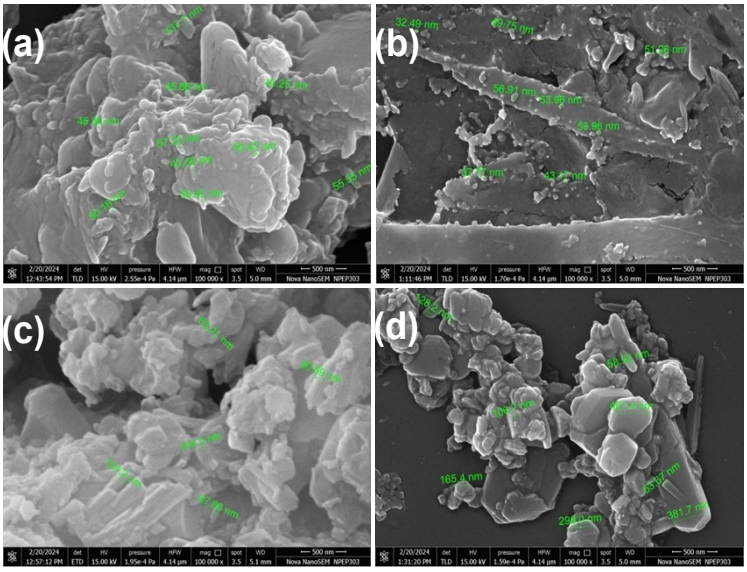

Fig. S2 FESEM images for (a) and (c) Pristine **Co-Et** and **Co-Pr**, respectively; (b) and (d) **Co-Et** and **Co-Pr** after OER electrocatalysis in 0.1 M KOH.

ELECTRONIC SUPPORTING INFORMATION

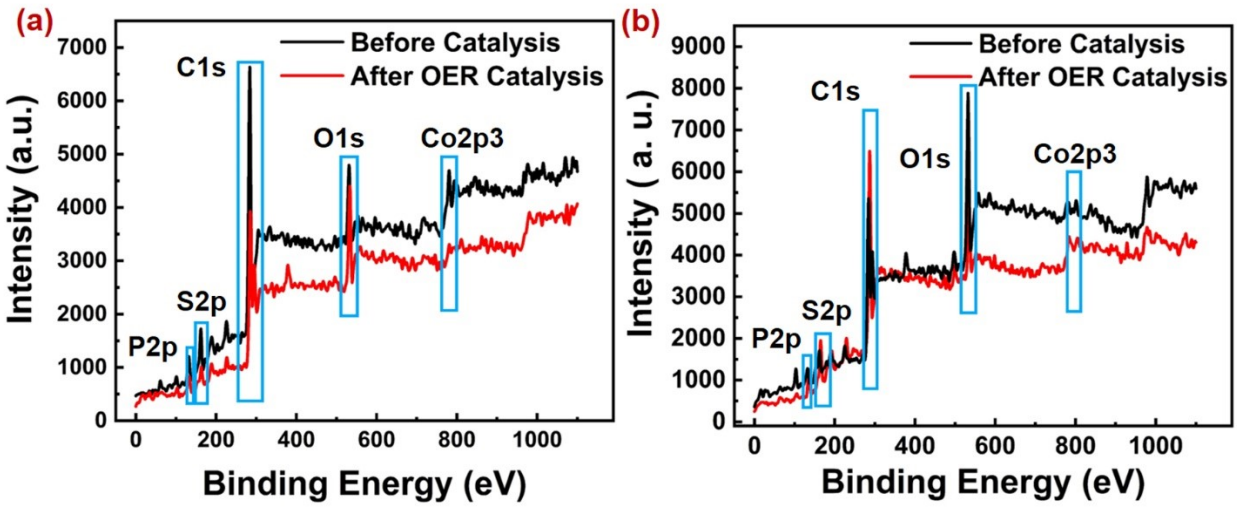

Fig. S3 XPS spectra for (a) **Co-Et** and (b) **Co-Pr** before and after OER electrocatalysis.

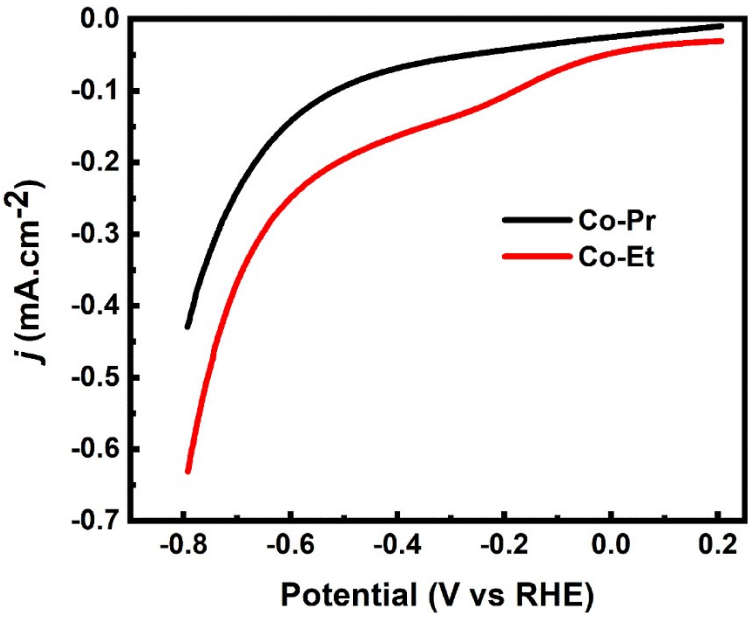

Fig. S4 Linear sweep votammograms for Co-Et and Co-Pr in 0.5 M H_2SO_4.

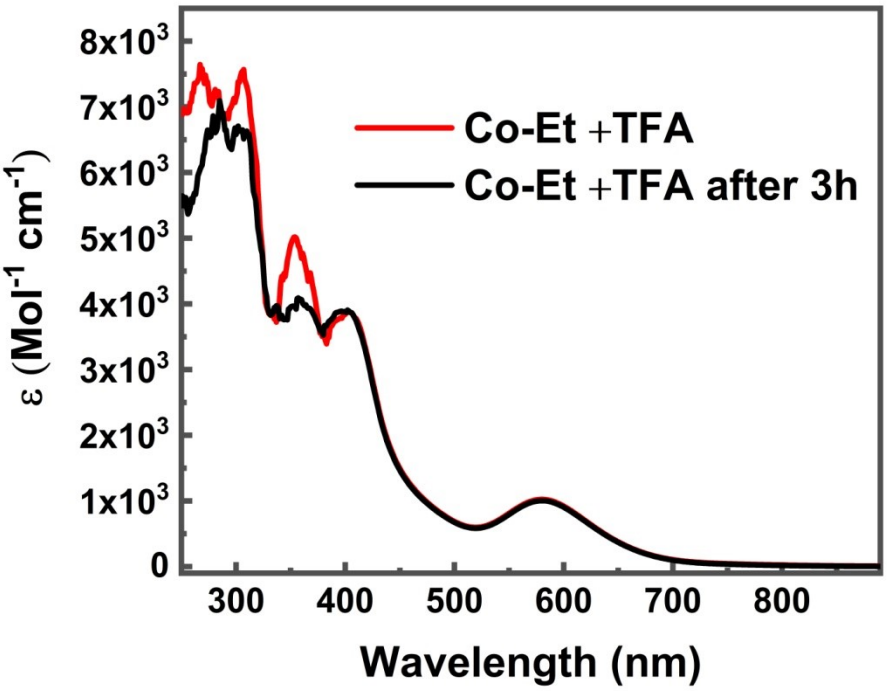

Fig. S5 The UV-Vis spectra for **Co-Et**+TFA recorded in acetonitrile at zero time and after 3 h.

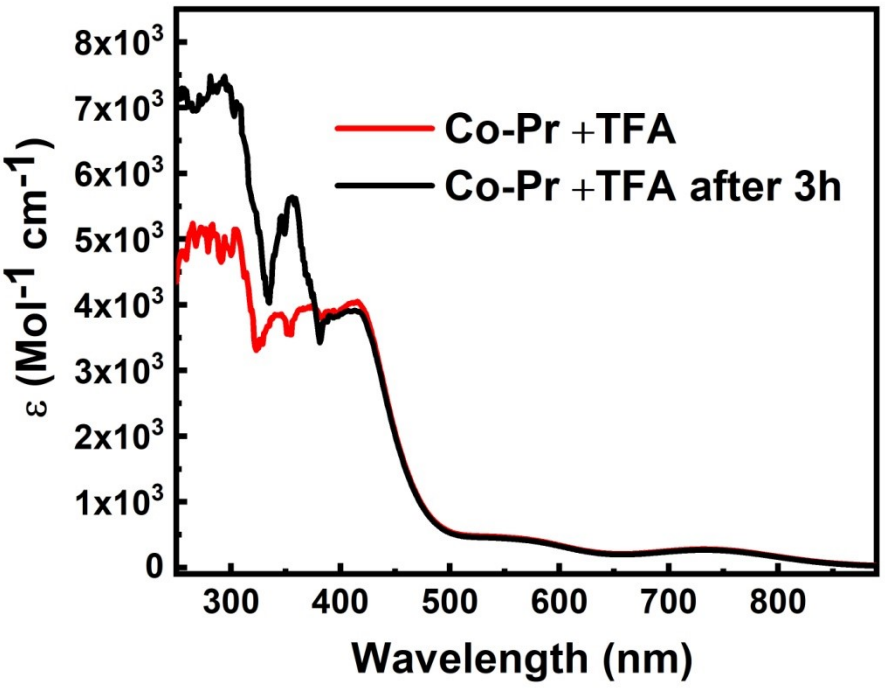

Fig. S6 The UV-Vis spectra for **Co-Pr**+TFA recorded in acetonitrile at zero time and after 3 h.

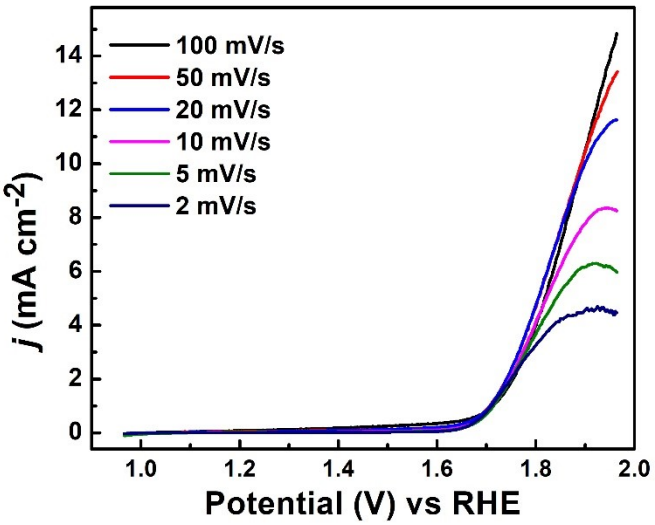

Fig. S7 Linear sweep voltammograms for **Co-Et** recorded at different scan rates in 0.1 M KOH solution.

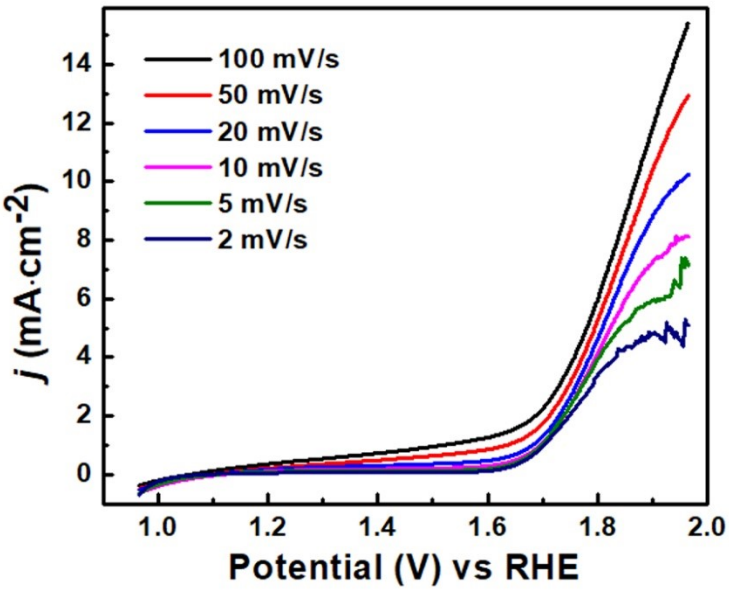

Fig. S8 Linear sweep voltammograms for **Co-Pr** recorded at different scan rates in 0.1 M KOH solution.

ELECTRONIC SUPPORTING INFORMATION

Table S1. Comparison of electrocatalytic behavior of different Cobalt based coordination complexes towards OER.

	Current density (mA/ cm^2)	Overpotential (in V)	Tafel Slope (mV/dec)	Ref
$[Co(OH_2)_2(PMBP)_2]$ (**1**)	10	0.140	50	1
$[Co(OH_2)_2(PMTP)_2]$ (**2**)	10	0.320	90	1
$([Co1.5(tib)(dcpna)]\cdot 6H_2O)$	10	0.360	89	2
$[CoL_2]$ (H_2L = 4-chloro-1,2-bis [2-hydroxy-5-(phenylazo)benzylideneamino]benzene	10	0.360	-	3
$[CoL_2]$ L_2:Bis[Salicylydene]-1,2-Iminophenylenediamine	2	0.140	84	3
[Co(L)(CHOH)] L: Soduim (E)-4-(2-hydroxylnaphtalene-1-yl)diazinyl benzenesulfonate	0.5	0.520	-	3
	5	0.720	-	3
$[Co^{III}(LN_2O_3)H_2O]$	10	0.500	-	4
Co-Et	10	0.672	114	This work
Co-Pr	10	0.724	151	This work

References

1. C. S. A. Djadock, S. Vengatesan, A. C. T. Kuate, J. Ngoune, S. Ravichandrana and S. Vasudevan, *Catal. Sci. Technol.,* 2023, 13, 2184-2200.
2. M. Qingguo, Y. Jianjian, M. Shixuan, Z. Mujun and L. Jitao, *Polymers*, 2017, 9, 676.
3. Z. Xiaoxin, H.Xiaoxi, G. Anandarup, S. Rafael, R. S. Bhaskar, M. Eliska, and A. Tewodros, *Angew. Chem. Int. Ed.*, 2014, 126, 4461–4465.
4. X. Zhicai, L. Qian, X. Wei, M. A. Abdullah, S. Xuping, Chem. Sus. Chem., 2015, 8(11), 1850–1855.