Supplementary Information

In-Situ Growth of $CaMoO_4$ on Electropolymerized PANI as Hybrid Electrocatalyst for Enhanced Oxygen Evolution

Nitika Garg,[a] *Ashok K. Ganguli*[a,b*]

[a]Department of Chemistry, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India

[b]Department of Chemical Sciences, Indian Institute of Science Education and Research Berhampur, Ganjam, Odisha-760003

Fig. S1: Digital picture of electrodeposited PANI electrode.

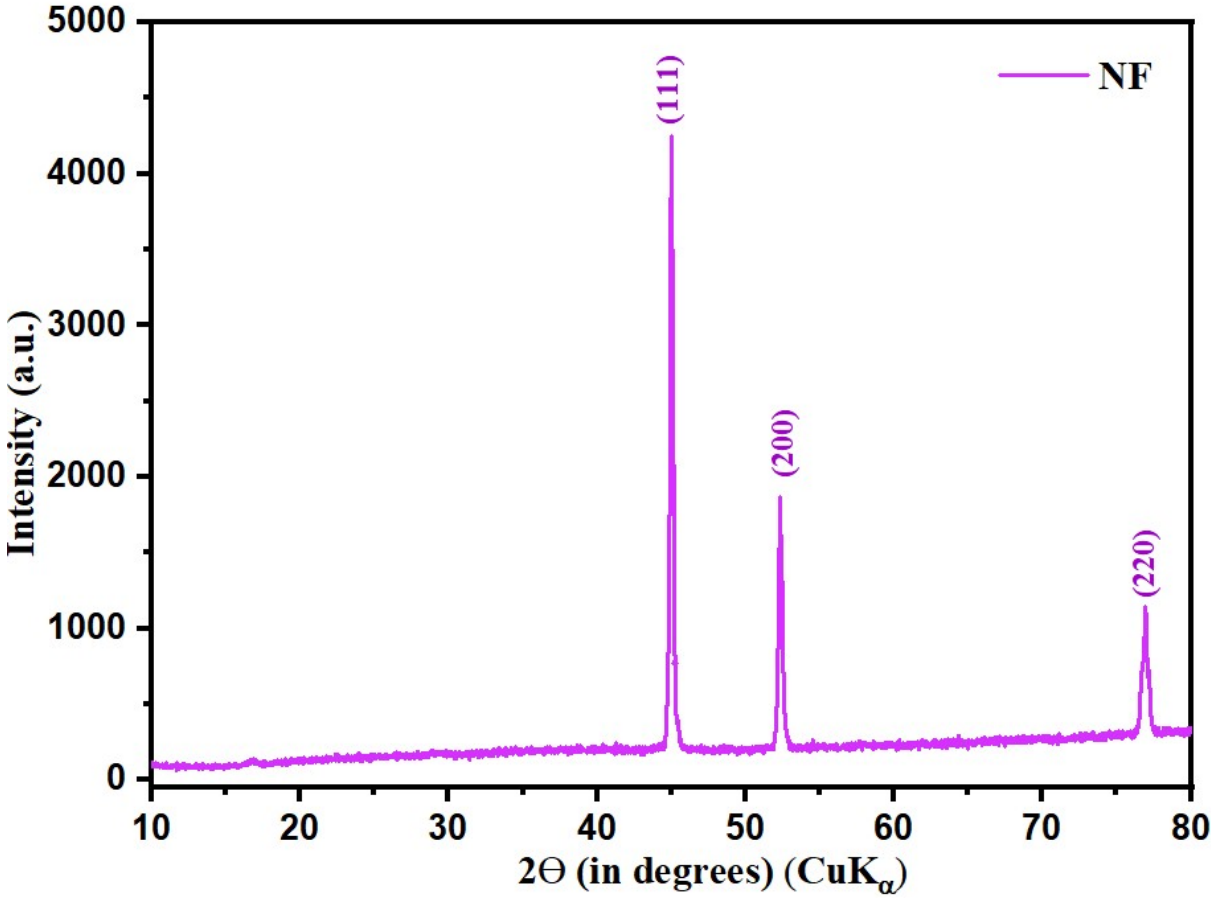

Fig. S2: PXRD pattern of bare nickel foam substrate.

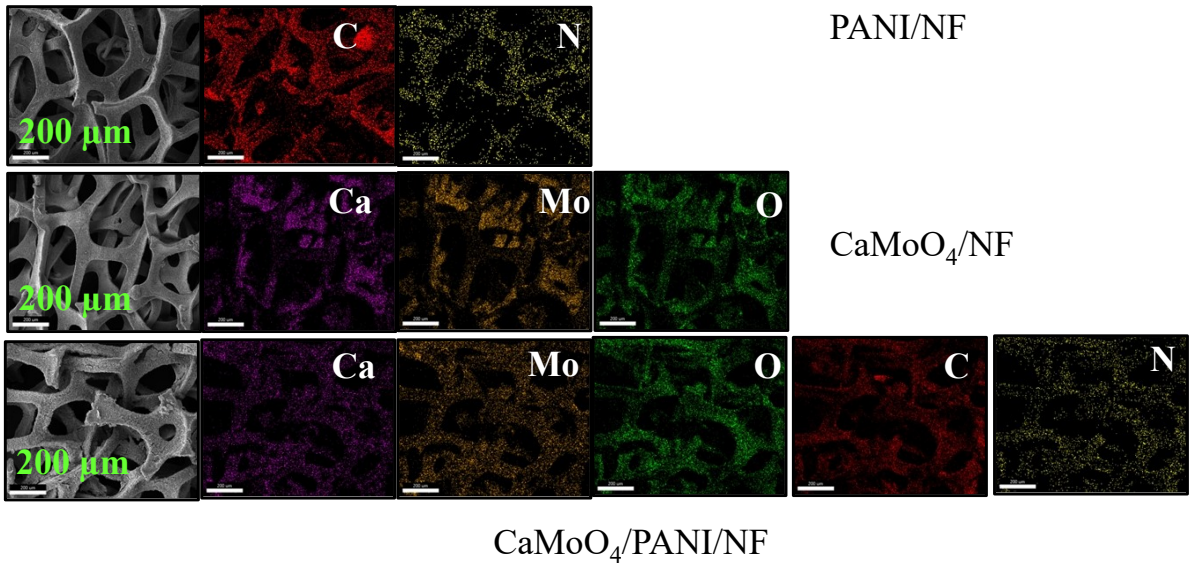

Fig. S3: EDS analysis of (a) and (b) PANI, (c) and (d) $CaMoO_4$, and (e) and (f) $CaMoO_4$/PANI.

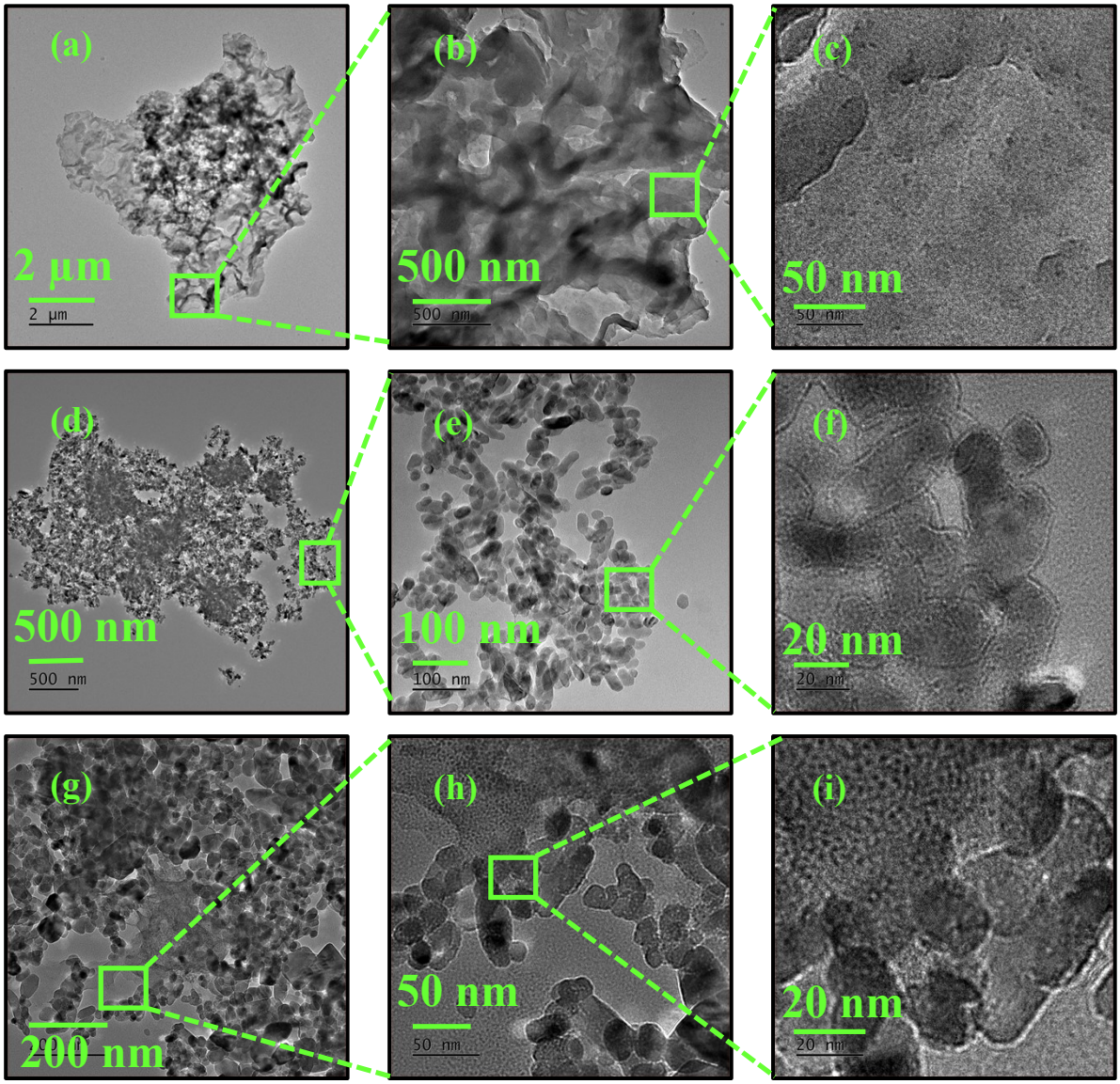

Fig. S4: TEM images of (a), (b) and (c) PANI, (d), (e) and (f) $CaMoO_4$, and (g), (h) and (i) $CaMoO_4$/PANI at different magnification.

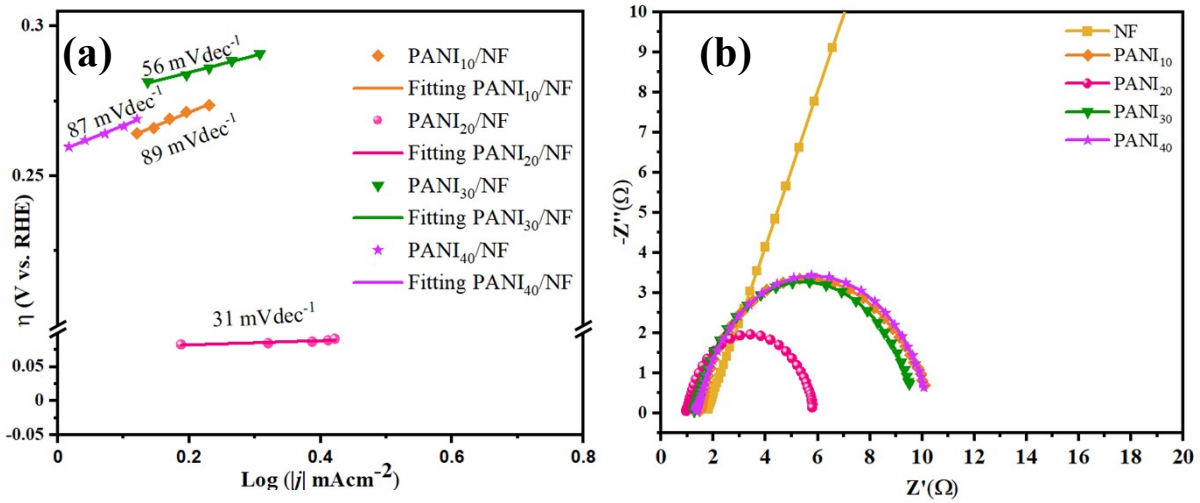

Fig. S5: (a) Tafel slope obtained from the polarization curves obtained using LSV measurements. (b) Nyquist plots.

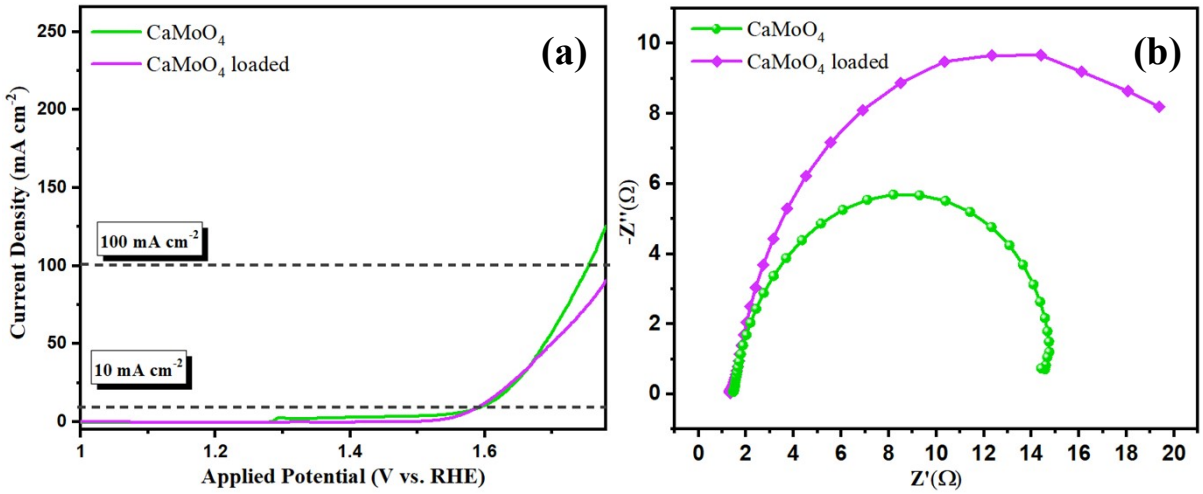

Fig. S6: (a) LSV curve and (b) Nyquist plot for comparison between binder-free $CaMoO_4$ electrode and $CaMoO_4$ electrode loaded on nickel foam using Nafion as binder.

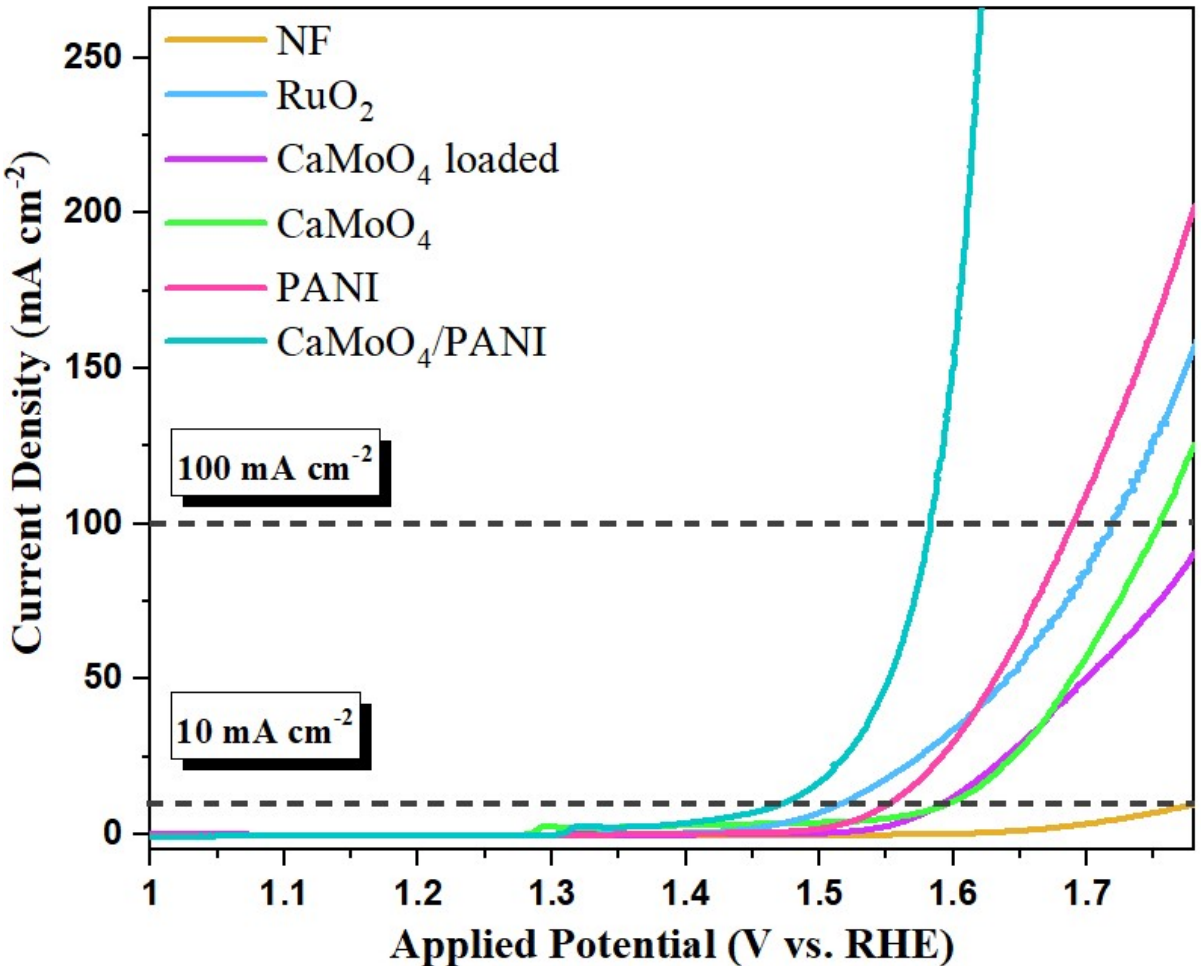

Fig. S7: LSV curves to compare OER activity of synthesized catalyst with noble metal catalyst (RuO_2).

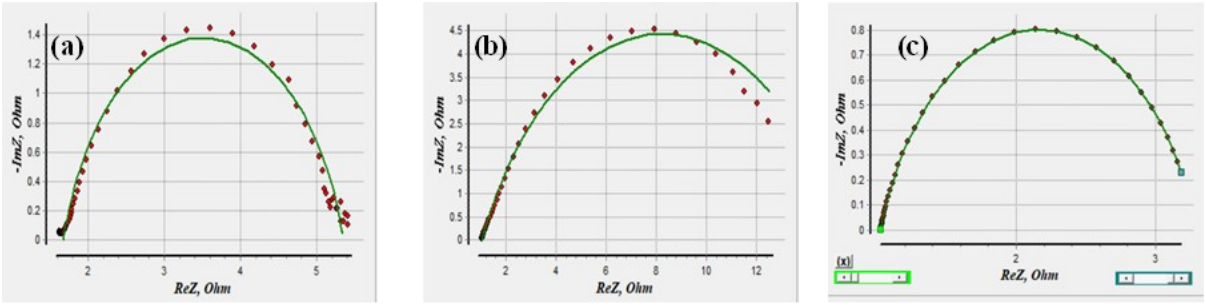

Fig. S8: Nyquist plots after circuit fitting (a) PANI, (b) $CaMoO_4$ and (c) $CaMoO_4$/PANI.

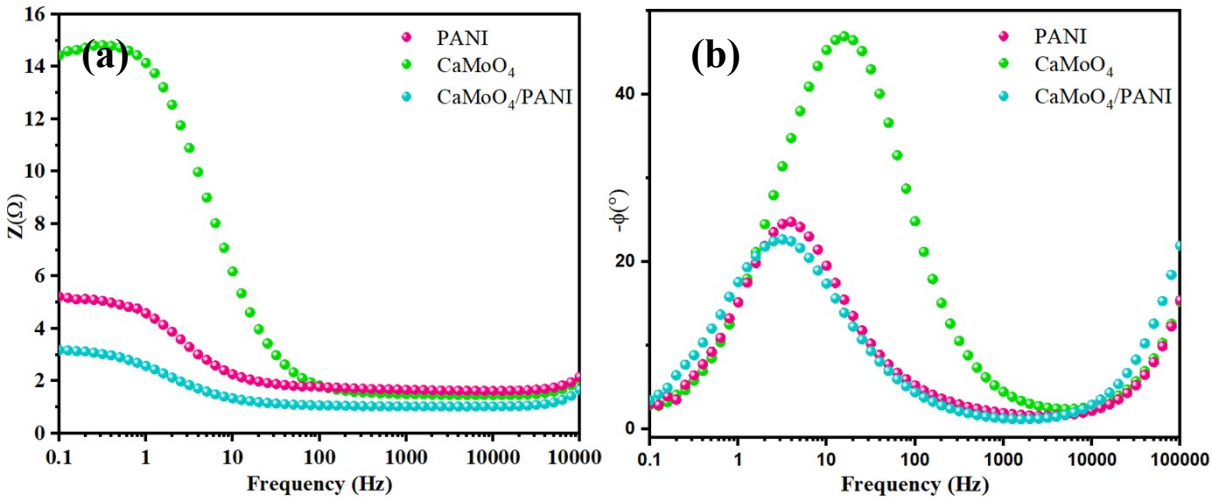

Fig. S9: (a) Bode plot (|Z| versus modulation frequency) and (b) Bode plot (ϕ versus modulation frequency) of PANI, $CaMoO_4$, and $CaMoO_4$/PANI.

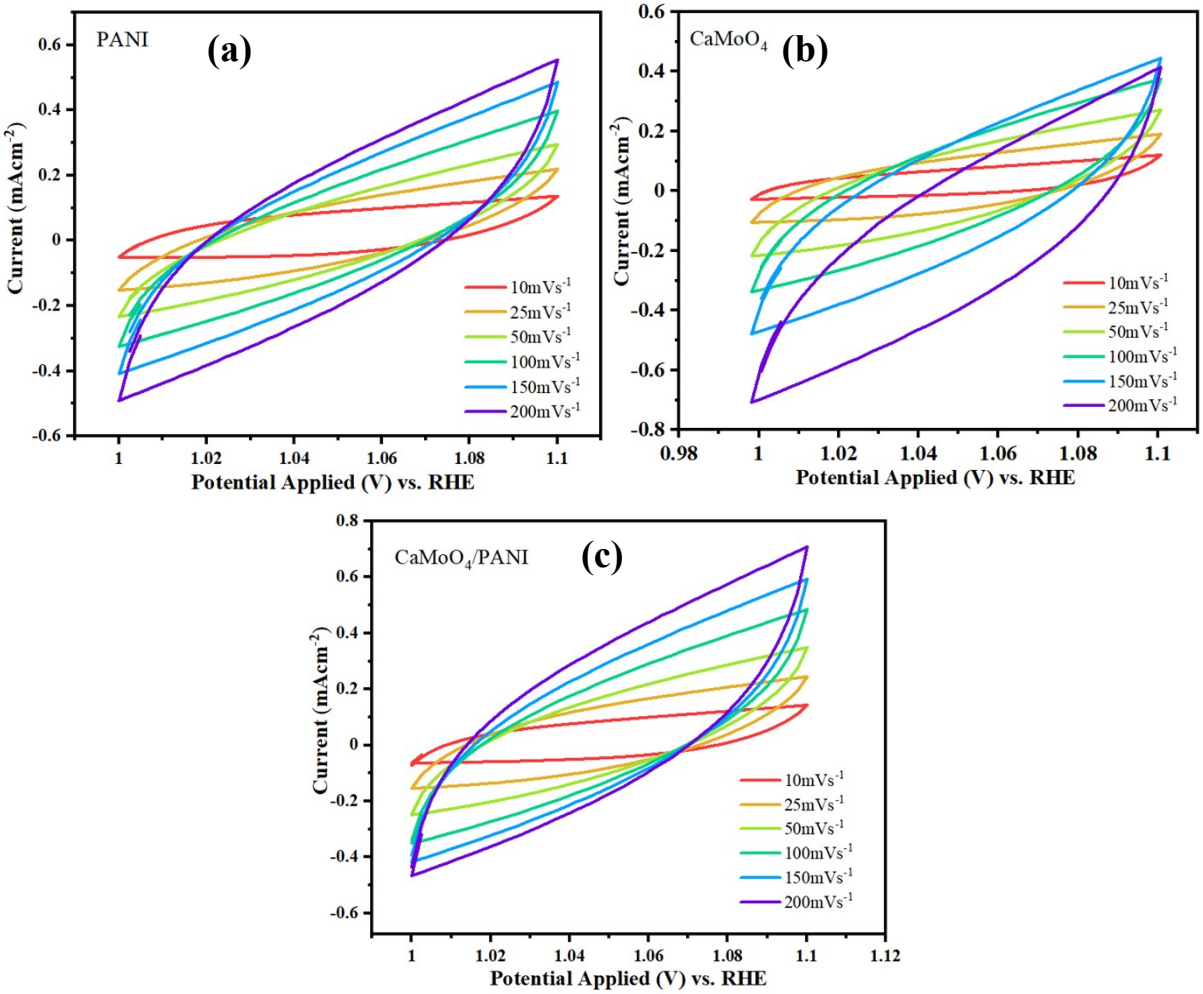

Fig. S10: CV curves for ECSA analysis in non-faradaic region of PANI, $CaMoO_4$, and $CaMoO_4$/PANI.

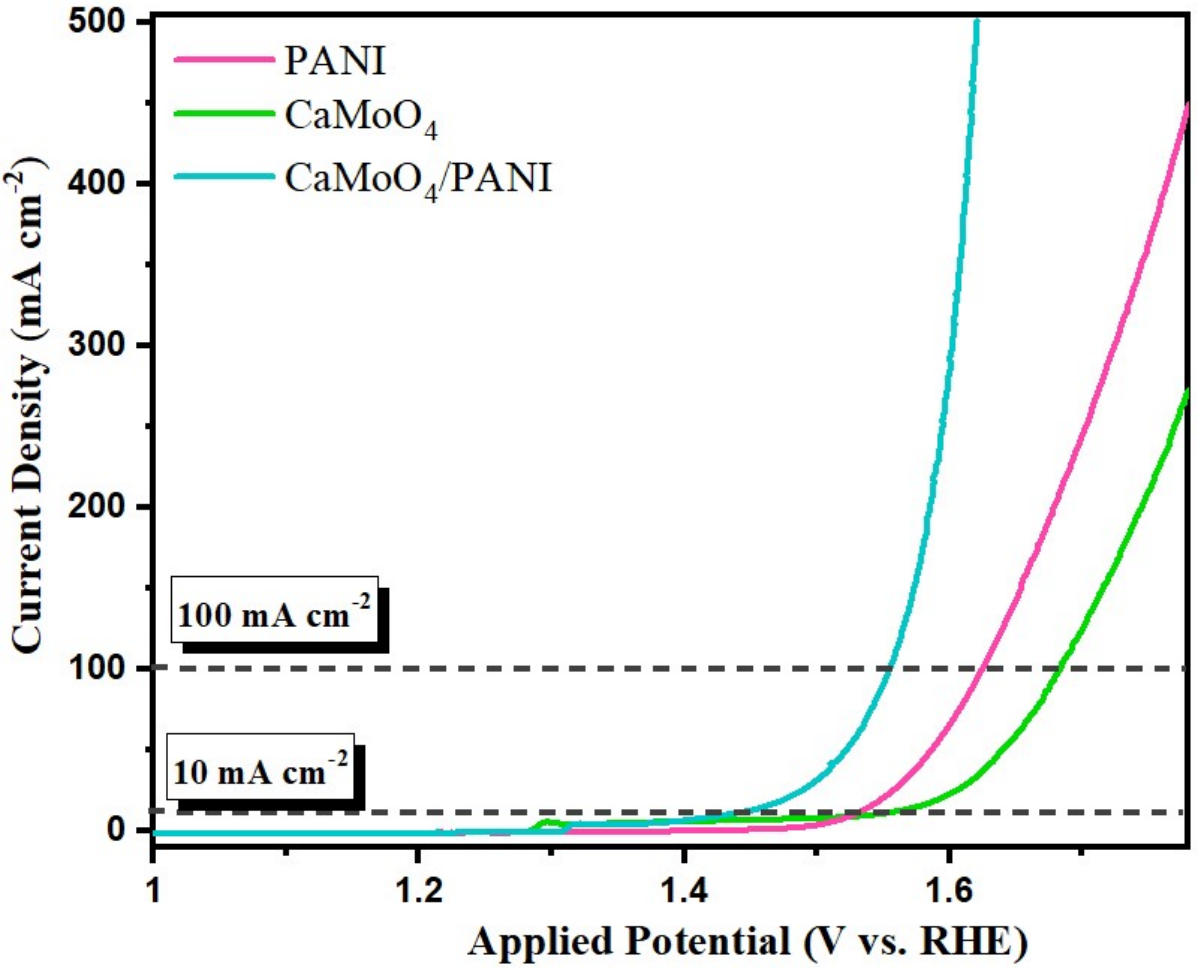

Fig. S11: ECSA corrected LSV curves of PANI, $CaMoO_4$ and $CaMoO_4$/PANI.

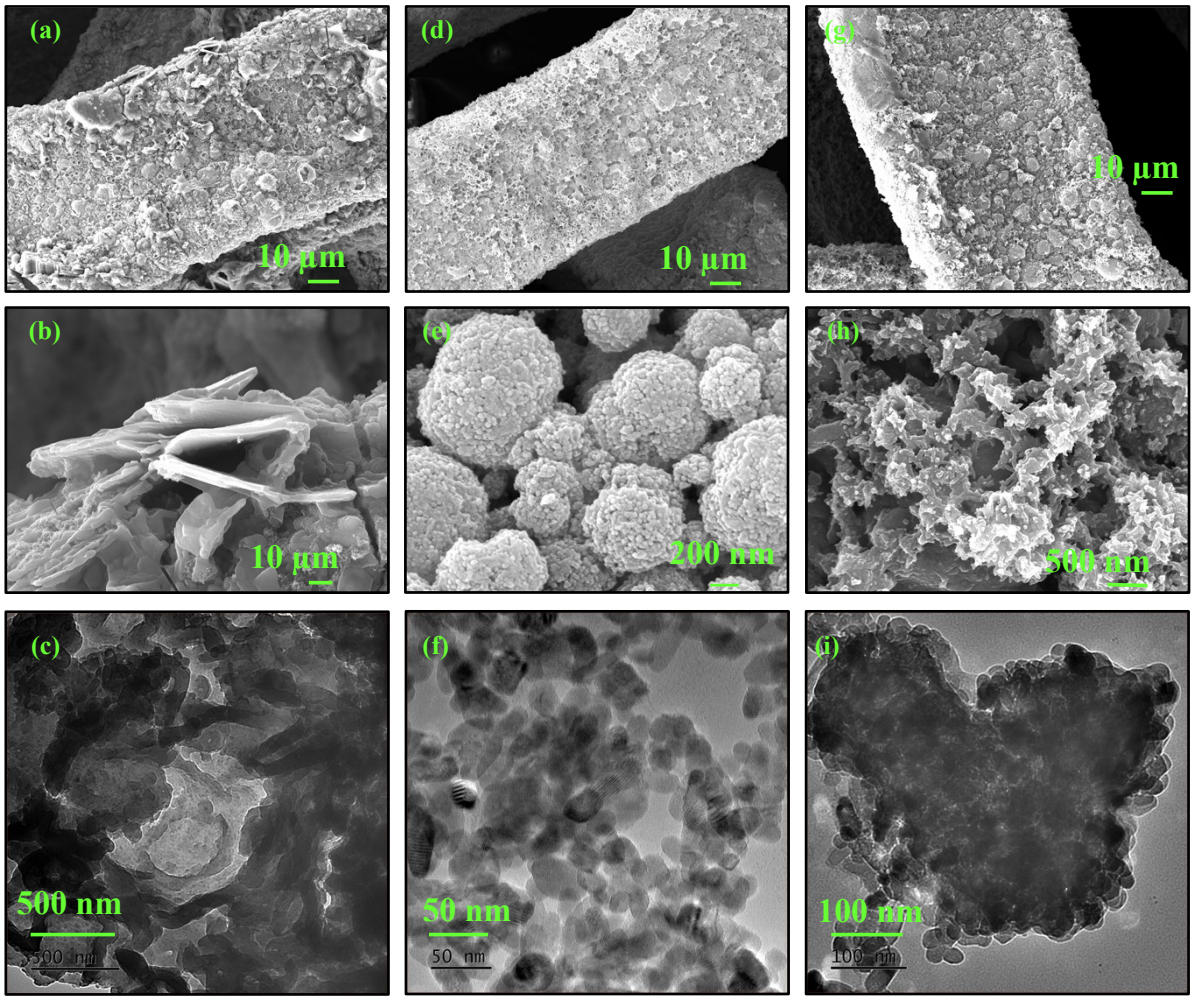

Fig. S12: SEM and TEM images after catalysis (a), (b) and (c) PANI, (d), (e) and (f) $CaMoO_4$ and (g), (h) and (i) $CaMoO_4$/PANI.

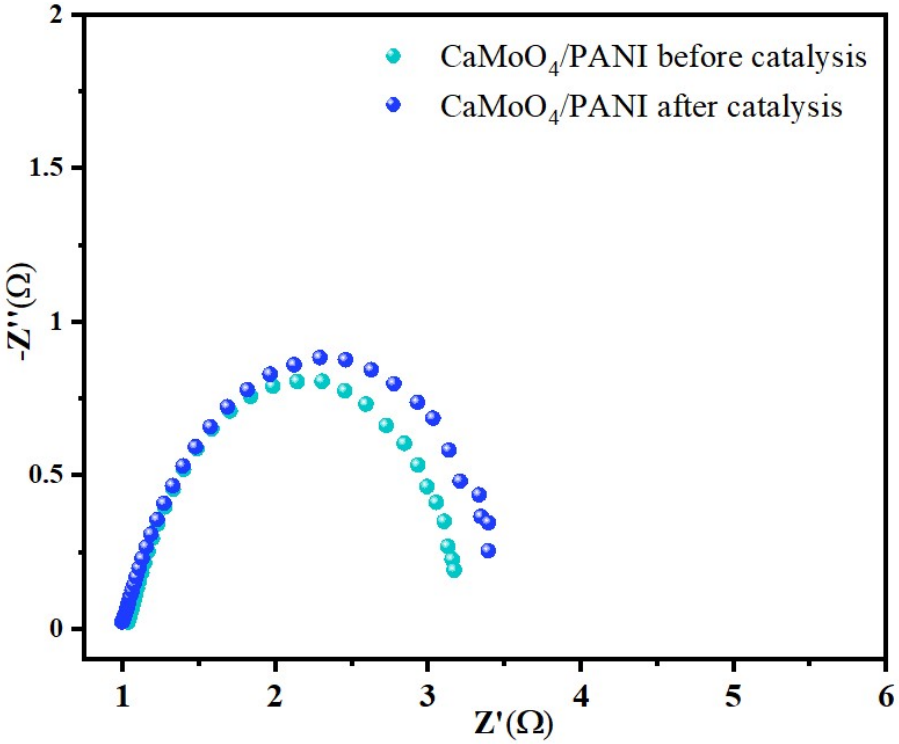

Fig. S13: Nyquist plot of $CaMoO_4$/PANI before and after catalysis

Table 1: OER electrocatalytic activity of PANI based previously reported catalysts in alkaline media

Catalyst	**Substrate**	***j* (mAcm^{-2})**	**η (mV)**	**References**
$CaMoO_4$/PANI	NF	10	233	This work
$CaMoO_4$	NF	50	345	[1]
NiO/MnO_2@PANI	PG (pyrolytic graphite electrode)	10	345	[2]
PANI@Co-Fe LDHs	GC (glassy carbon electrode)	10	261	[3]
Co_4Ni_1@PANI	NF	10	288	[4]
$CoFe_2O_4$/PANI-MWCNTs	GC	10	314	[5]
NiFeLDH@PANi-CF	CF	100	380	[6]
PANI@NiO	NF	10	301	[7]
PANI coated Ni_3Mo_2P-MoO_3	NF	100	290	[8]
CoMoS-PANI	NF	10	250	[9]

References:

1 Y. Gou, Q. Liu, X. Shi, A. M. Asiri, J. Hu and X. Sun, *Chem Commun.*, 2018, **54**, 5066–5069.

2 J. He, M. Wang, W. Wang, R. Miao, W. Zhong, S.-Y. Chen, S. Poges, T. Jafari, W. Song, J. Liu and S. L. Suib, *ACS Appl. Mater. Interfaces*, 2017, **9**, 42676–42687.

3 X. Sun, X. Liu, R. Liu, X. Sun, A. Li and W. Li, *Catal. Commun.*, 2020, **133**, 105826.

4 V. Ashok, S. Mathi, M. Sangamithirai and J. Jayabharathi, *Energy & Fuels*, 2022, **36**, 14349–14360.

5 Y. Liu, J. Li, F. Li, W. Li, H. Yang, X. Zhang, Y. Liu and J. Ma, *J. Mater. Chem. A*, 2016, **4**, 4472–4478.

6 N. Lingappan, I. Jeon and W. Lee, *J. Mater. Chem. A*, 2023, **11**, 17797–17809.

7 J. Zhang, Y. Cao, H. Xu, X. Liu, J. Gong, Y. Tong, G. Zhang, Y. Li, C. Tong and Z. Li, *J. Phys. Chem. Lett.*, 2024, 4088–4095.

8 J. Teng, D. Liu, X. Zhang and J. Guo, *J. Electroanal. Chem.*, 2022, **908**, 116129.

9 S. Mathew, J.-H. Sim, R. Rajmohan, O. L. Li and Y.-R. Cho, *Electrochim. Acta*, 2022, **403**, 139586.