SUPPLEMENTARY FILE

Dual functionality of silver and bismuth-based molybdenum disulfide multiple phases towards effective oxygen evolution reaction and dye degradation

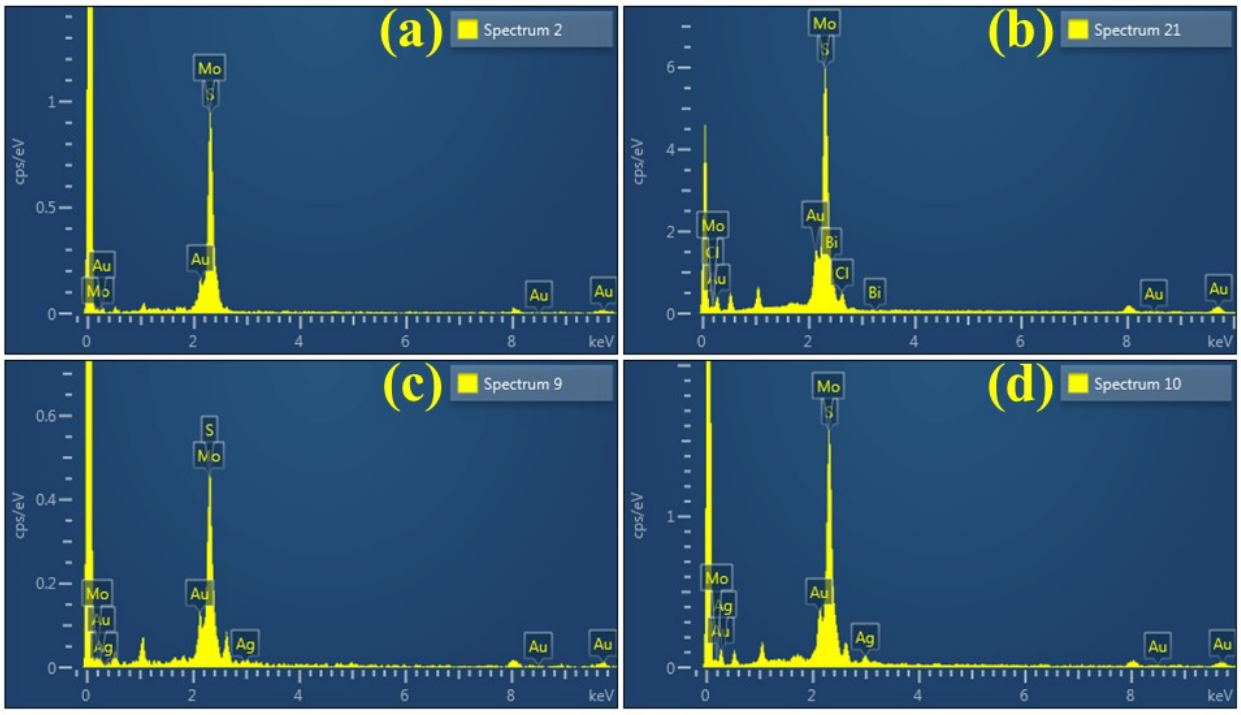

Fig. S1: EDS spectra of (a) MoS_2, (b) Bi-MoS_2, (c) 1% Ag/Bi-doped MoS_2, and (d) 3% Ag/Bi-doped MoS_2

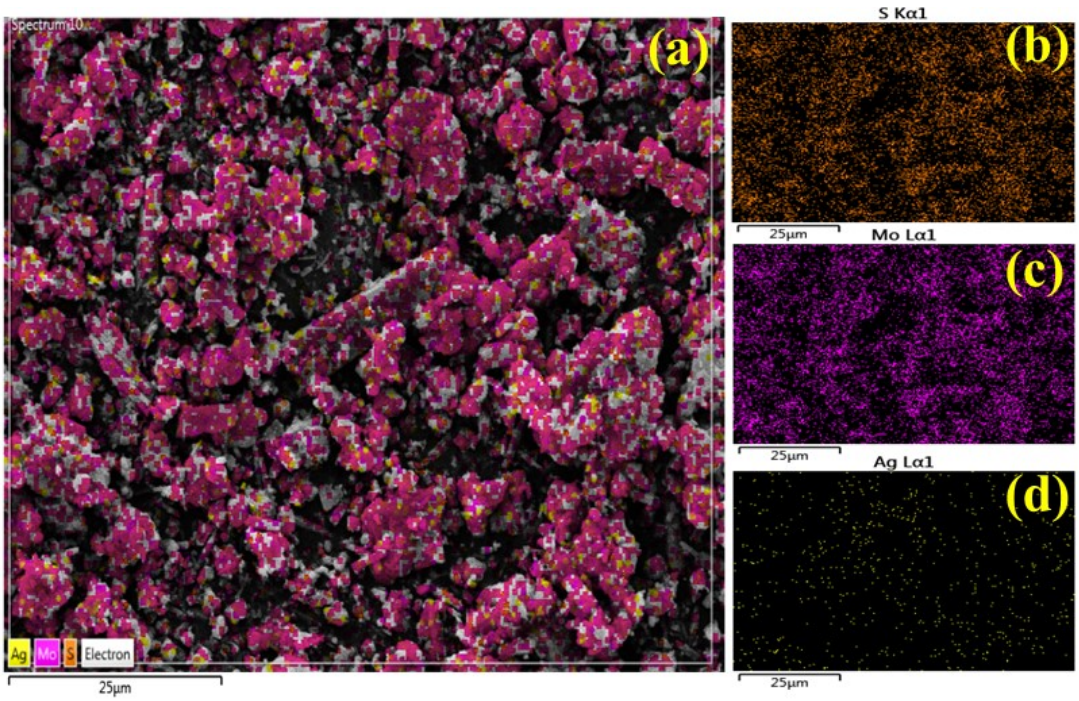

Fig. S2: Mapping profiles of 3% Ag/Bi-doped MoS_2

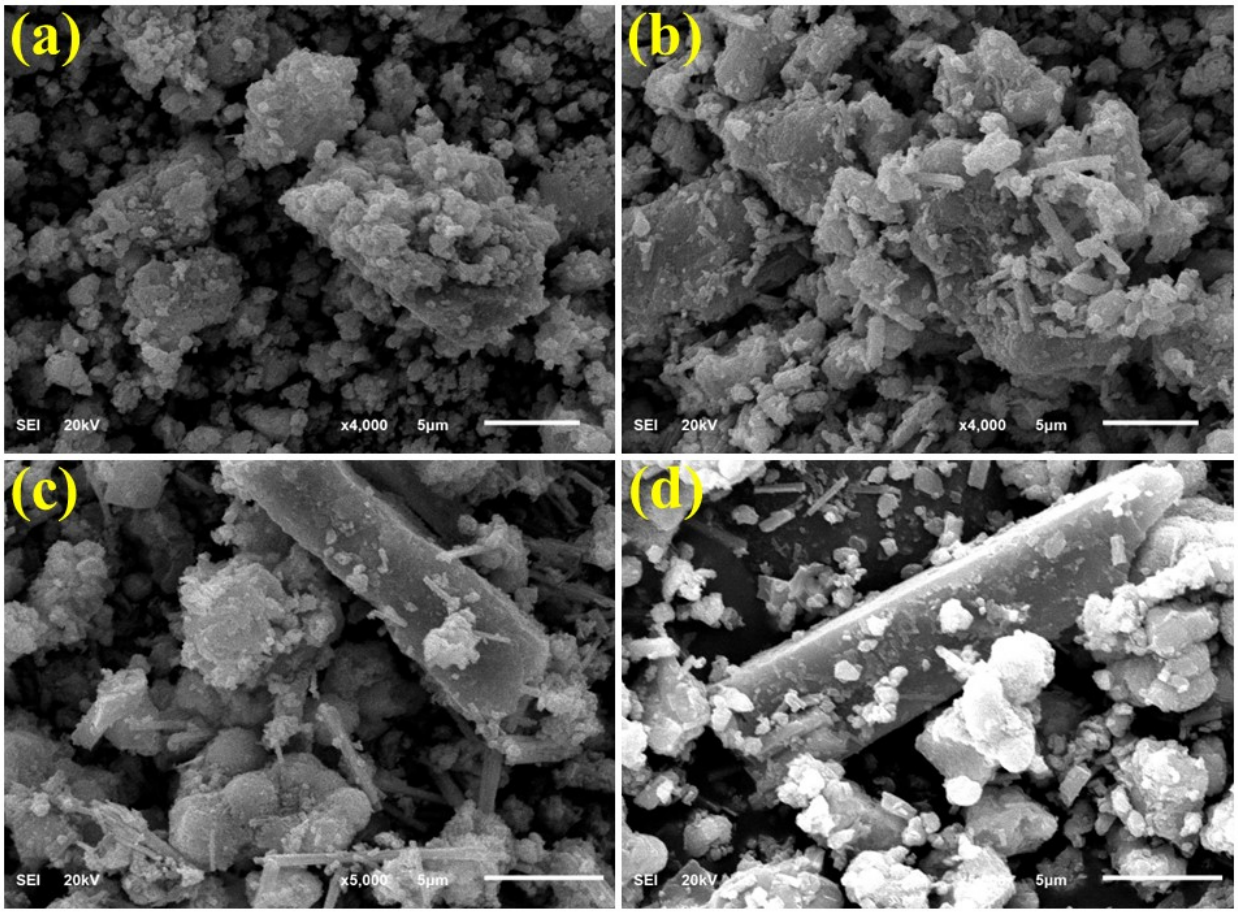

Fig. S3: FESEM images of (a) MoS_2, (b) Bi-MoS_2, (c) 1% Ag/Bi-doped MoS_2, and (d) 3% Ag/Bi-doped MoS_2

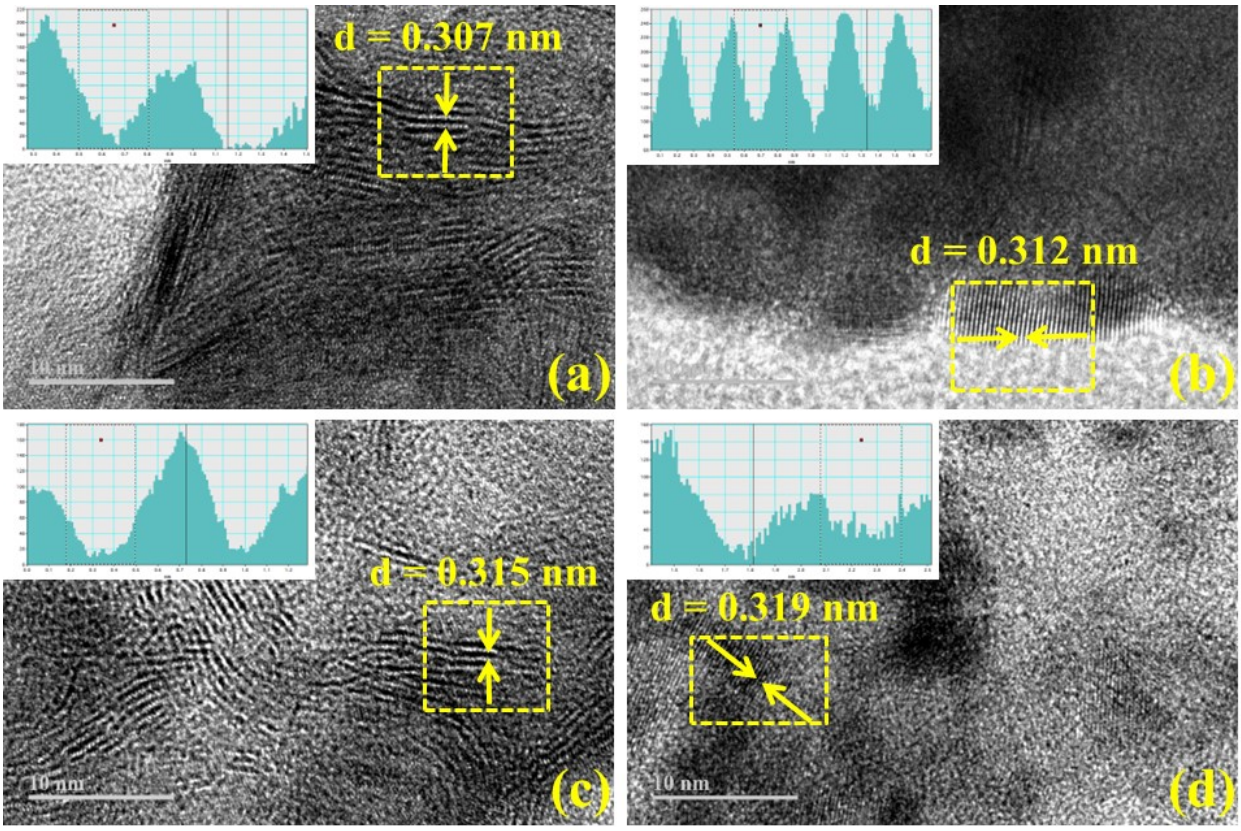

Fig. S4: HRTEM images of (a) MoS_2, (b) Bi-MoS_2, (c) 1% Ag/Bi-doped MoS_2, and (d) 3% Ag/Bi-doped MoS_2

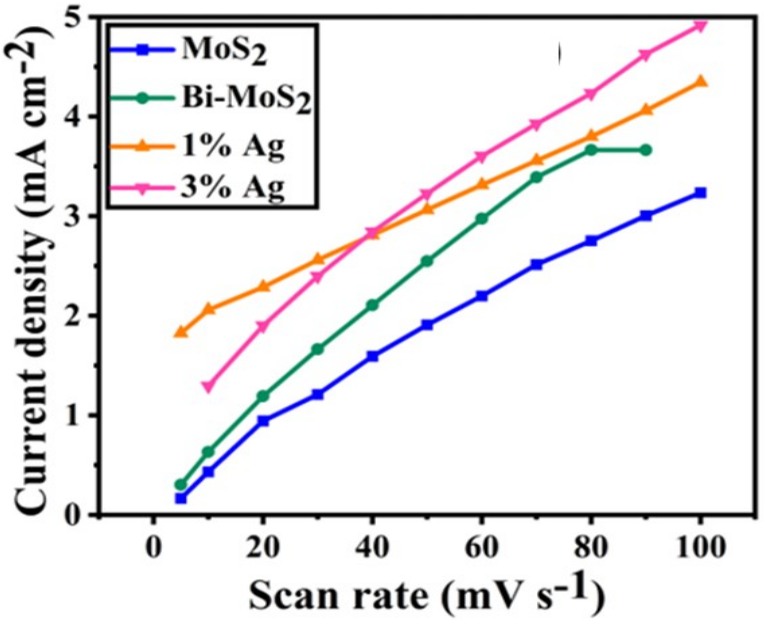

Fig. S5: Double layer capacitance (C_{dl}) plot derived from the current density versus scan rate (5 to 100 mV s^{-1})

The stability test of 3% Ag/Bi-MoS_2 using chronopotentiomtry analysis was shown in Fig. S6.

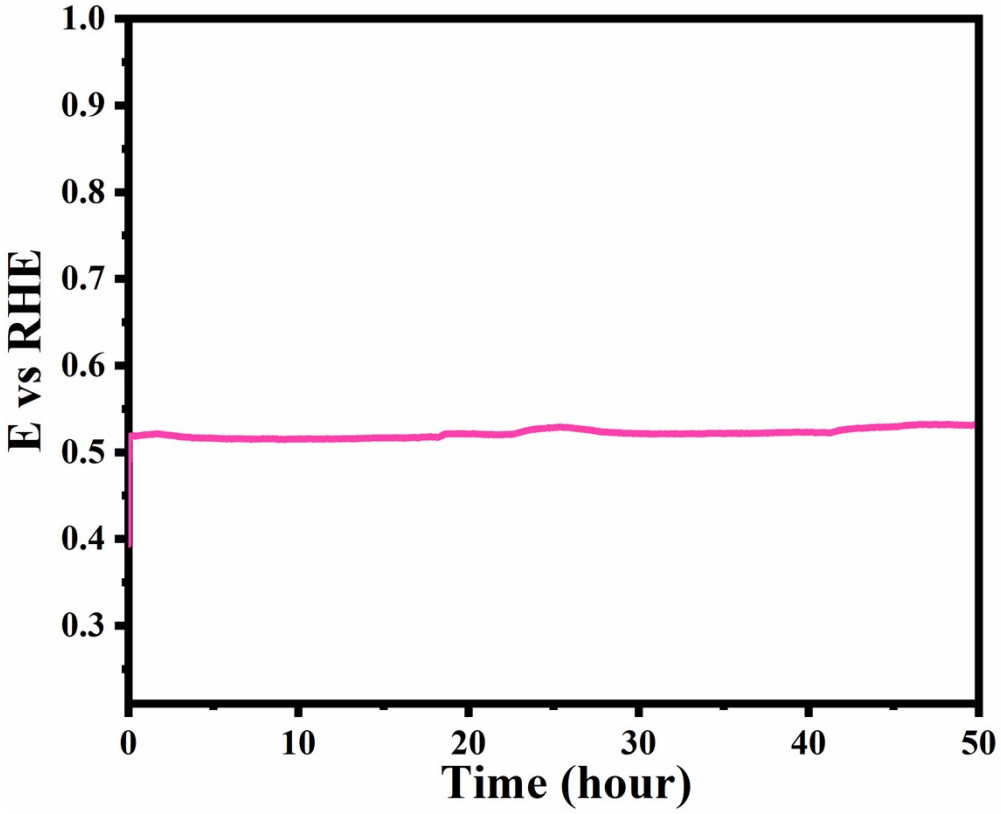

Fig. S6: Chronopotentiometry analysis of 3% Ag/Bi-MoS_2

Table S1: Camparison of present study with previous reported study.

Sr. no.	Material	Overpotential	Current density	ECSA/C_{dl}	Tafel slope	Electrolyte	Ref.
1.	MoS_2/Co–N–CN_2	398 mV	10 mA/cm^2	-	169 mV dec^{-1}	1 M KOH	[1]
2.	Ni-MoS_2/RGO	349 mV	10 mA/cm^2	-	145.9 mV dec^{-1}	1 M KOH	[2]
3.	Co-MoS_2/BCCF-21	260 mV	10 mA/cm^2	174.9 mF cm^{-2}	85 mV dec^{-1}	1 M KOH	[3]
4.	MoS_2/Ni_3S_2	218 mV	10 mA/cm^2	-	88 mV dec^{-1}	1 M	[4]

						KOH	
5.	ZnCo−N/C@MoS_2	1.66 V	10 mA/cm^2	-	149.85 mV dec^{-1}	1 M KOH	[5]
6.	Ag doped CuS	270 mV	10 mA/cm^2	-	95 mV dec^{-1}	1 M KOH	[6]
7.	$Bi_{0.05}Ru_{0.95}O_2$	203.5 mV	10 mA/cm^2	-	52.90 mV dec^{-1}	0.5M H_2SO_4	[7]
8.	Bi doped NiFe LDH	85 mV	10 mA/cm^2	-	48.01 mV dec^{-1}	1 M KOH	[8]
9.	RuO_2	266 mV	10 mA/cm^2	-	-	1 M KOH	present
10.	3% Ag/Bi-doped MoS_2	192 mV	10 mA/cm^2	19.55 mF cm^{-2}	65.3 mV dec^{-1}	1 M KOH	Present work

REFERENCES

1. Hou, X., et al., *MoS2 nanoplates embedded in Co–N-doped carbon nanocages as efficient catalyst for HER and OER.* ACS Sustainable Chemistry & Engineering, 2020. **8**(14): p. 5724-5733.
2. Zhao, M., et al., *One step hydrothermal synthesis of Ni-MoS2-RGO bifunctional electrocatalysts for HER and OER.* International Journal of Electrochemical Science, 2021. **16**(3): p. 210323.
3. Xiong, Q., et al., *Cobalt covalent doping in MoS2 to induce bifunctionality of overall water splitting.* Advanced materials, 2018. **30**(29): p. 1801450.
4. Zhang, J., et al., *XL Interface Engineering of MoS2/Ni3S2 Heterostructures for Highly Enhanced Electrochemical Overall-water-splitting Activity.* Angew. Chem, 2016. **128**: p. 6814-6819.
5. Wang, Z., et al., *Synergistic Zn and MoS2 Tailored Co− N/C Environments Enabling Bifunctional ORR/OER Electrocatalysis for Advanced Li− O2 Batteries.* Angewandte Chemie International Edition, 2025. **64**(16): p. e202425502.
6. Chinnadurai, D., N. Manivelan, and K. Prabakar, *Modulating the Intrinsic Electrocatalytic Activity of Copper Sulfide by Silver Doping for Electrocatalytic Overall Water Splitting.* ChemElectroChem, 2022. **9**(10): p. e202200254.
7. Chen, S., et al., *Bi-doped ruthenium oxide nanocrystal for water oxidation in acidic media.* Nanoscale, 2024. **16**(45): p. 20940-20947.
8. Lu, S., et al., *Unveiling the role of bismuth doping in NiFe layered double hydroxide catalysts: Synergistic electronic modulation for superior oxygen evolution activity.* International Journal of Hydrogen Energy, 2025. **123**: p. 23-31.