

Supporting Information

Enhanced Optical, Magnetic and Hydrogen Evolution Reaction Properties of Mo_{1-x}Ni_xS₂ Nanoflakes

Levna Chacko¹, Pankaj Kumar Rastogi², T. N. Narayanan², M. K. Jayaraj³ and P. M.

Aneesh^{1*}

¹Department of Physics, Central University of Kerala, Tejaswini Hills,

Periye, Kasaragod, Kerala, India- 671316

²Tata Institute of Fundamental Research - Hyderabad, Sy. No. 36/P Serilingampally Mandal,
Gopanapally Village, Hyderabad - 500 107, India.

³Centre for Advanced Materials, Department of Physics, Cochin University of Science and
Technology, Kochi, Kerala, India-682022

* Corresponding Author E-mail: *aneeshpm@cukerala.ac.in

Figure S1

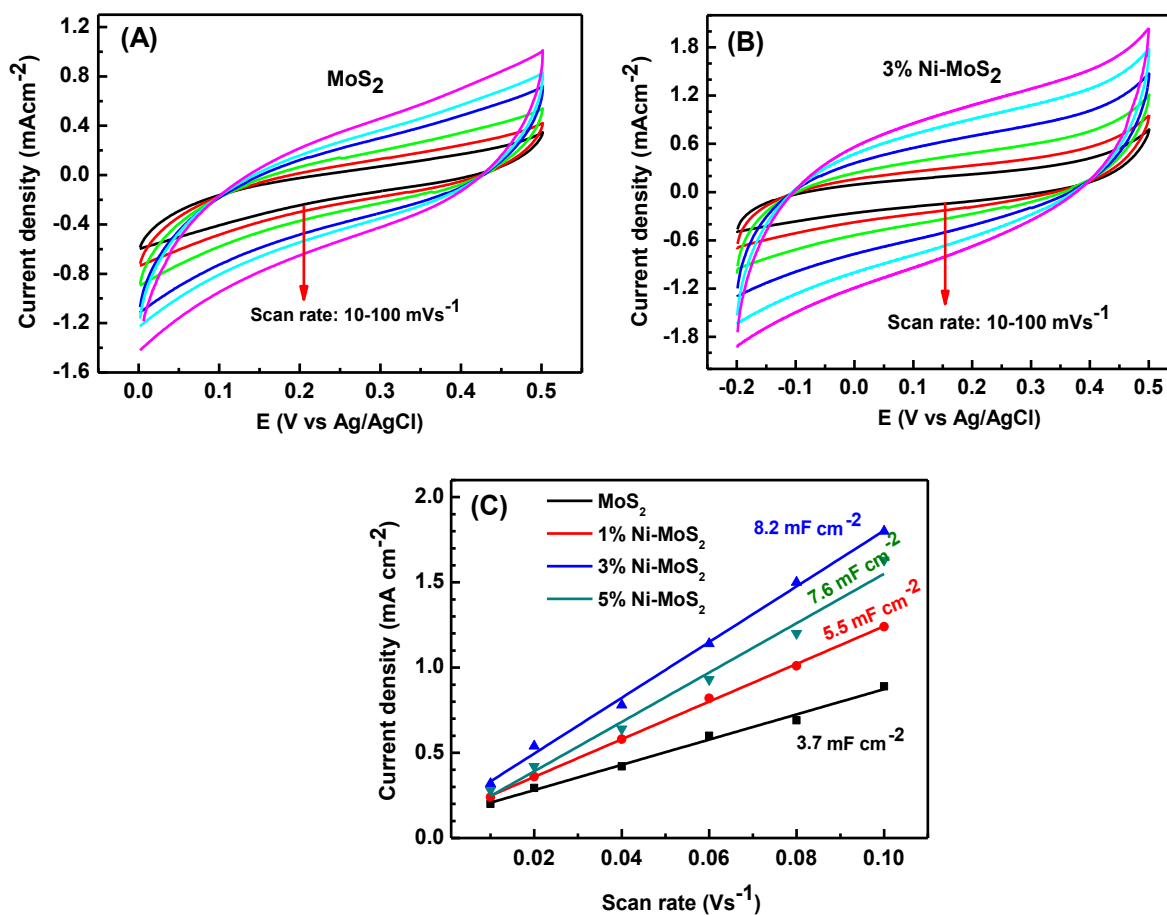


Figure S1. Cyclic voltammograms of (A) pristine MoS₂ and (B) 3% Ni-MoS₂ in a 0.5 M H₂SO₄ solution at different scan rates (10-100 mVs⁻¹). (C) Relations of difference between anodic and cathodic currents ($\Delta J = J_a - J_c$) at 0.2 V with various scan rates.

The C_{dl} can be calculated from the plot (C), where the slope of the ΔJ vs. scan rate curve is $2C_{dl}$. The high C_{dl} value leads to larger electrochemical surface area and more active sites for better HER performance.

Figure S2

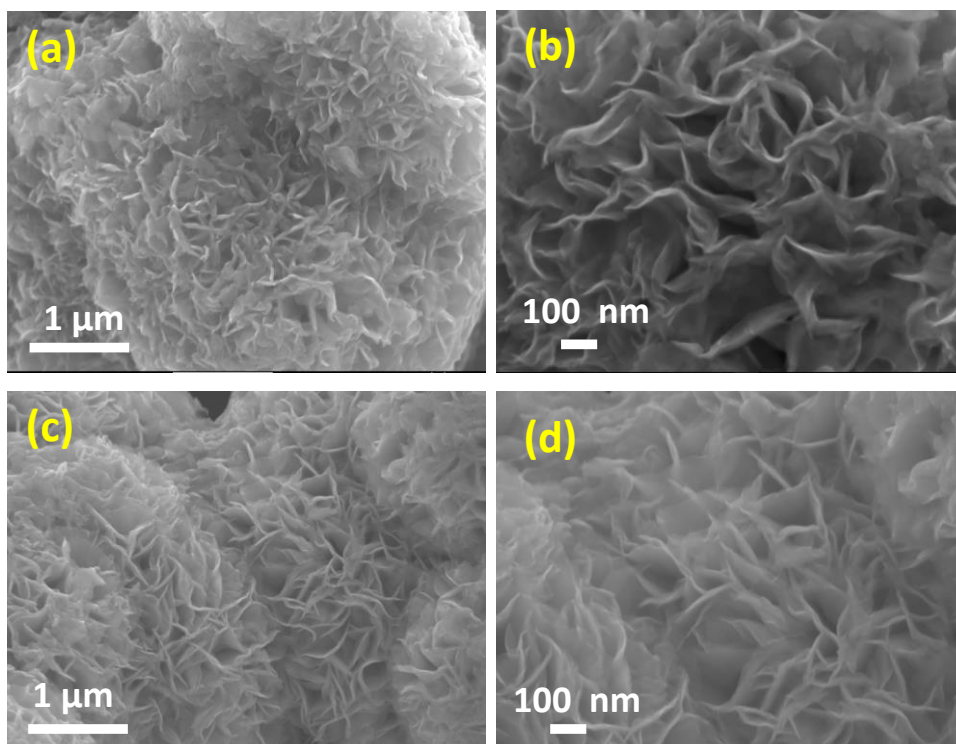


Figure S2. Low (a,c) and high (b,d) magnification SEM images of 3% Ni-MoS₂ film on GC before (a, b) and after (c, d) the durability measurements.

Figure S3

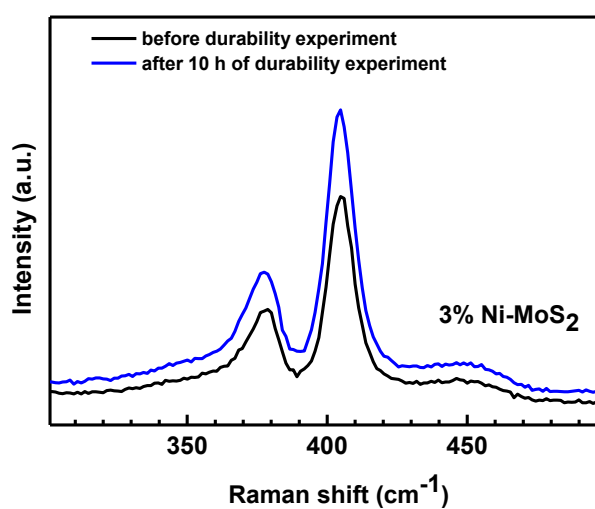


Figure S3. Raman spectra of 3% Ni-MoS₂ film on GC before and after the durability measurements.

Figure S4

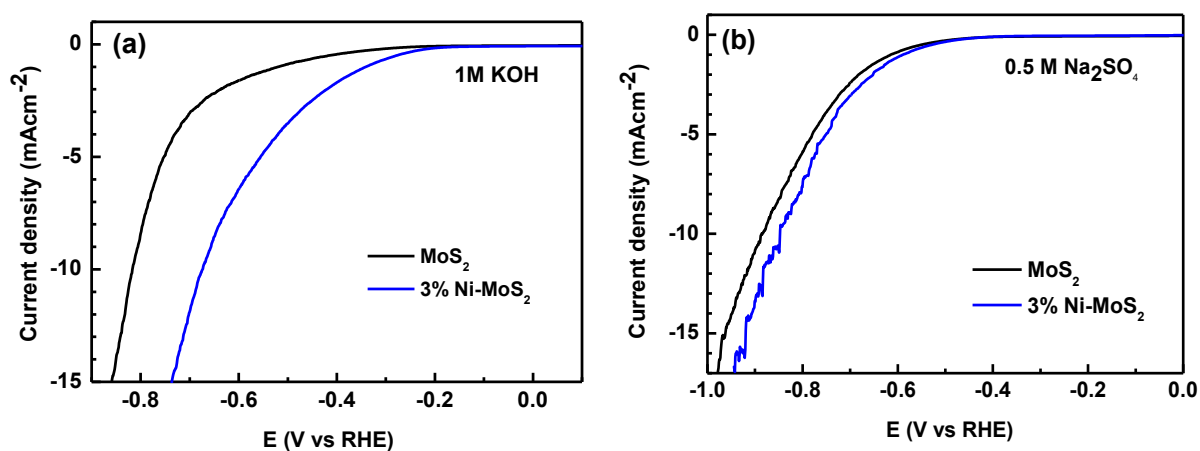


Figure S4. LSVs of MoS₂ and 3% Ni-MoS₂ modified electrodes in (a) alkaline (1 M KOH) and in (b) neutral (0.5 M Na₂SO₄) electrolytes at 2 mV s⁻¹ scan rate.

Figure S5

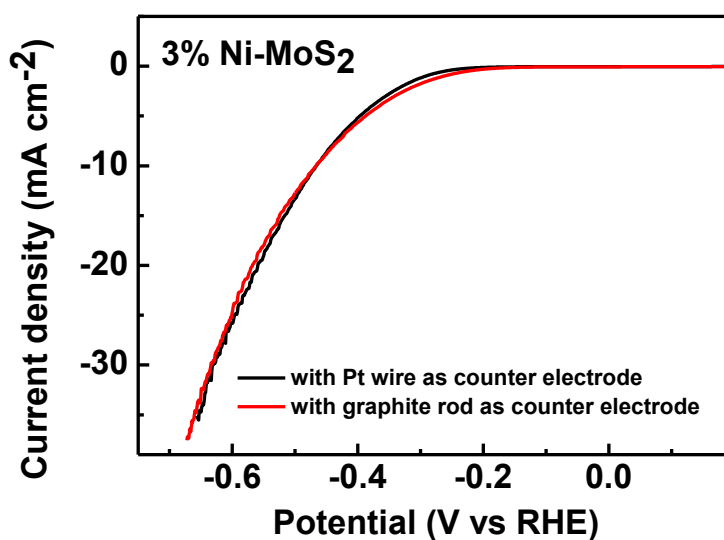


Figure S5. Polarization curves showing the comparison of the 3% Ni-MoS₂ electrode with Pt wire (black) and graphite rod (red) as counter electrodes.

Table S1. Summary of the valuable parameters of the MoS₂ and various Mo_{1-x}Ni_xS₂ electrocatalysts in acidic medium.

Samples	Overpotential (at 1 mAcm⁻²) (mV)	R_{ct} (KΩ)	Tafel slope (mV/decade)	Exchange current density (J₀) (mAcm⁻²)	C_{dl} (mFcm⁻²)
MoS ₂	418	3.402	162	2.2 x 10 ⁻³	3.7
1% Ni-MoS ₂	392	2.519	146	3.2 x 10 ⁻³	5.5
3% Ni-MoS ₂	297	0.730	94	8.5 x 10 ⁻³	8.2
5% Ni-MoS ₂	370	1.400	130	4.6 x 10 ⁻³	7.6