Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Heterointerfaces of Nickel Sulphides and Selenides on Ni-foam as Efficient Bifunctional Electrocatalyst in Acidic Environment

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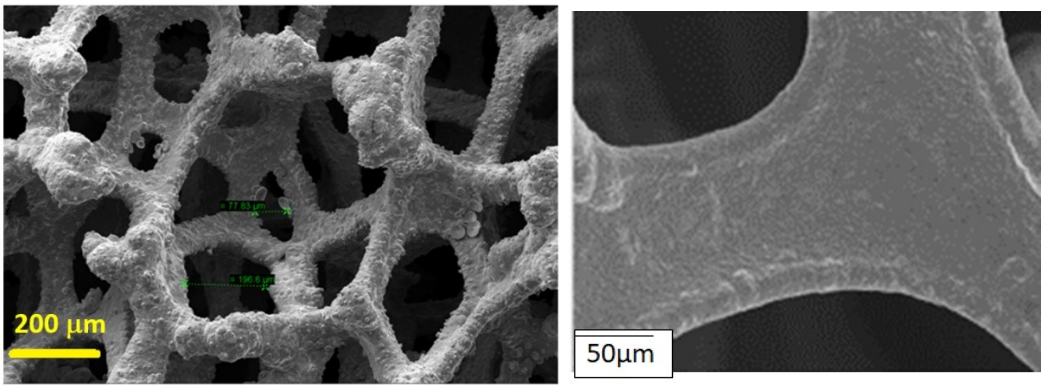

Figure S1: FE-SEM image of the Ni-foam used (low and high magnifications).

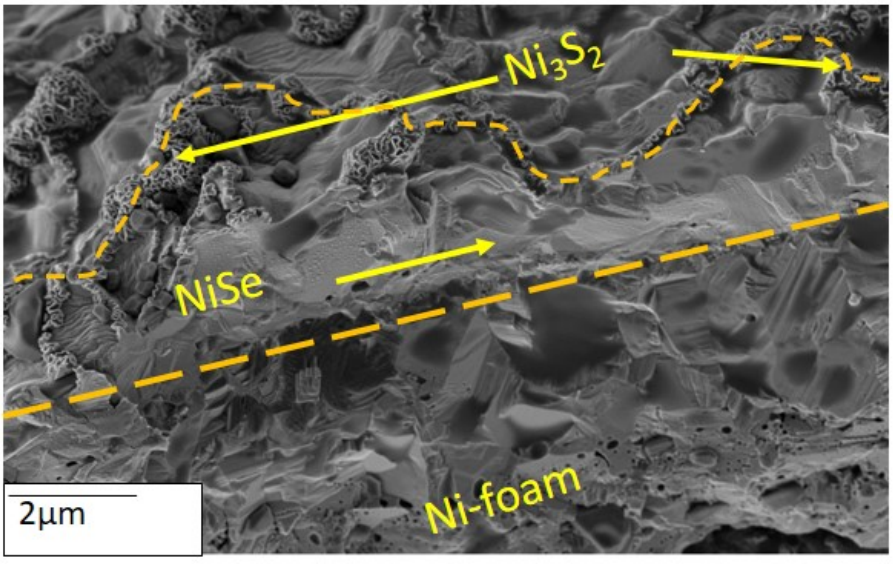

Figure S2: Cross sectional FE-SEM images of the heterointerface electrode NX600C.

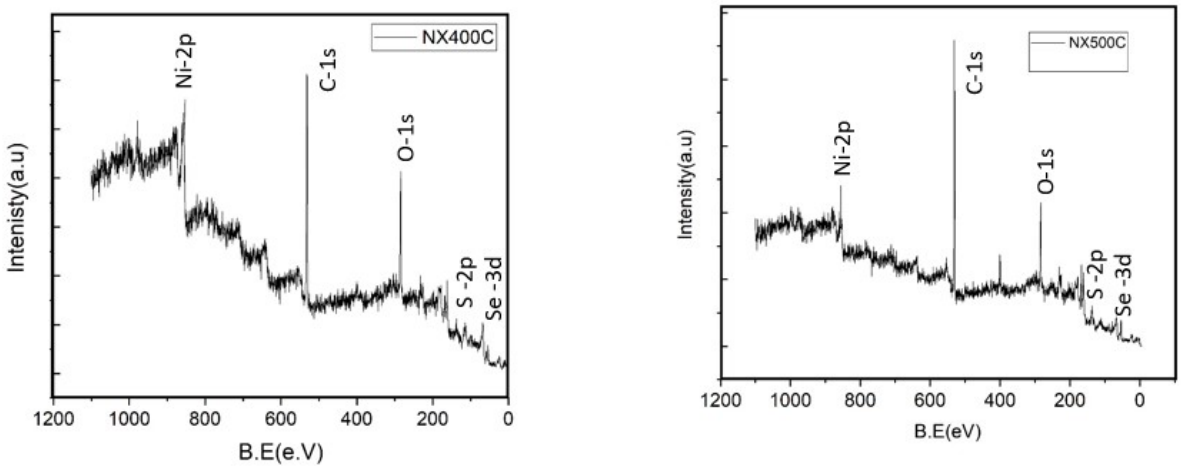

Figure S3: XPS survey spectra for samples NX400C and NX500C.

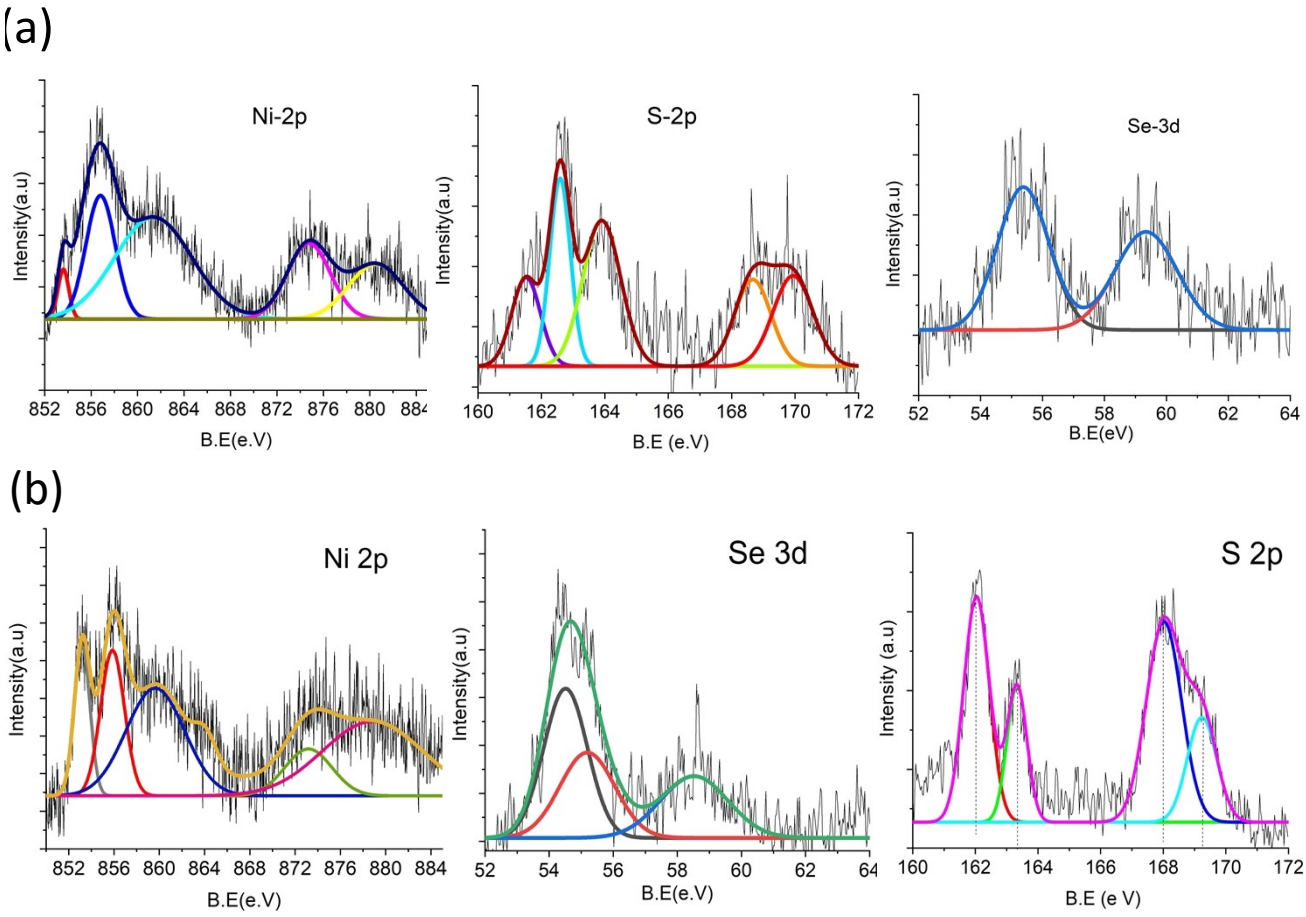

Figure S4: High resolution XPS spectra for samples NX400C (a) and NX500C (b).

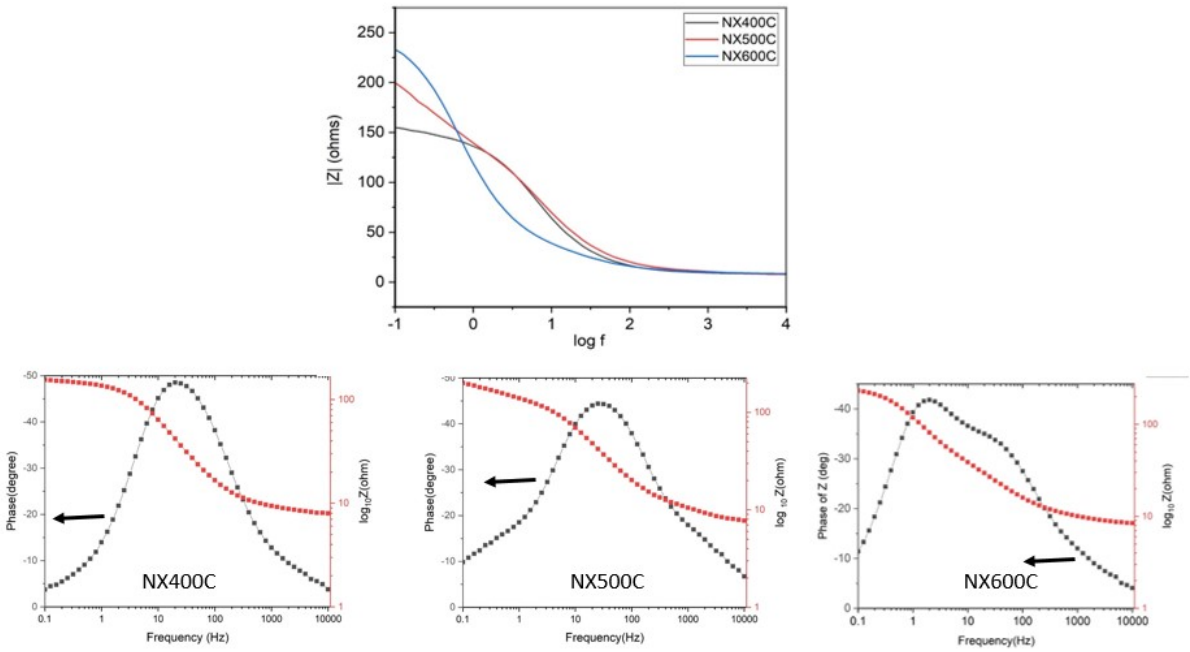

Figure S5: The Bode amplitude and phase plots.

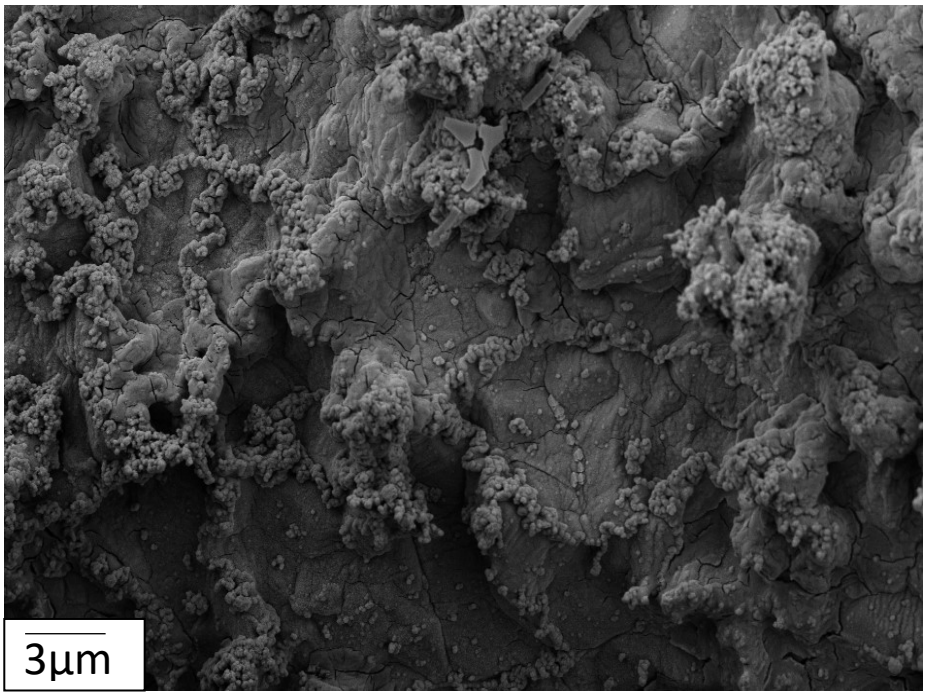

Figure S6: Morphology (FE-SEM image) of the NX600C electrode after 18hr of stability test.

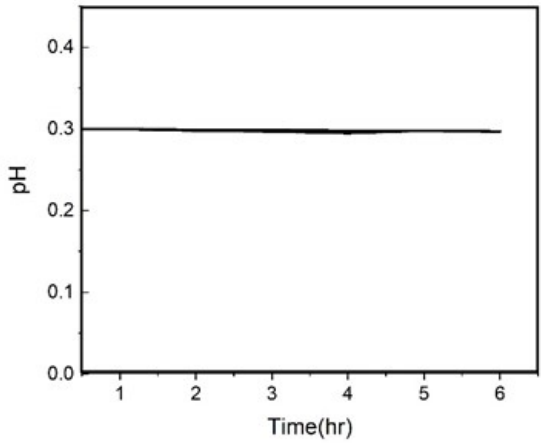

Figure S7: Variation of pH under OER stability test.

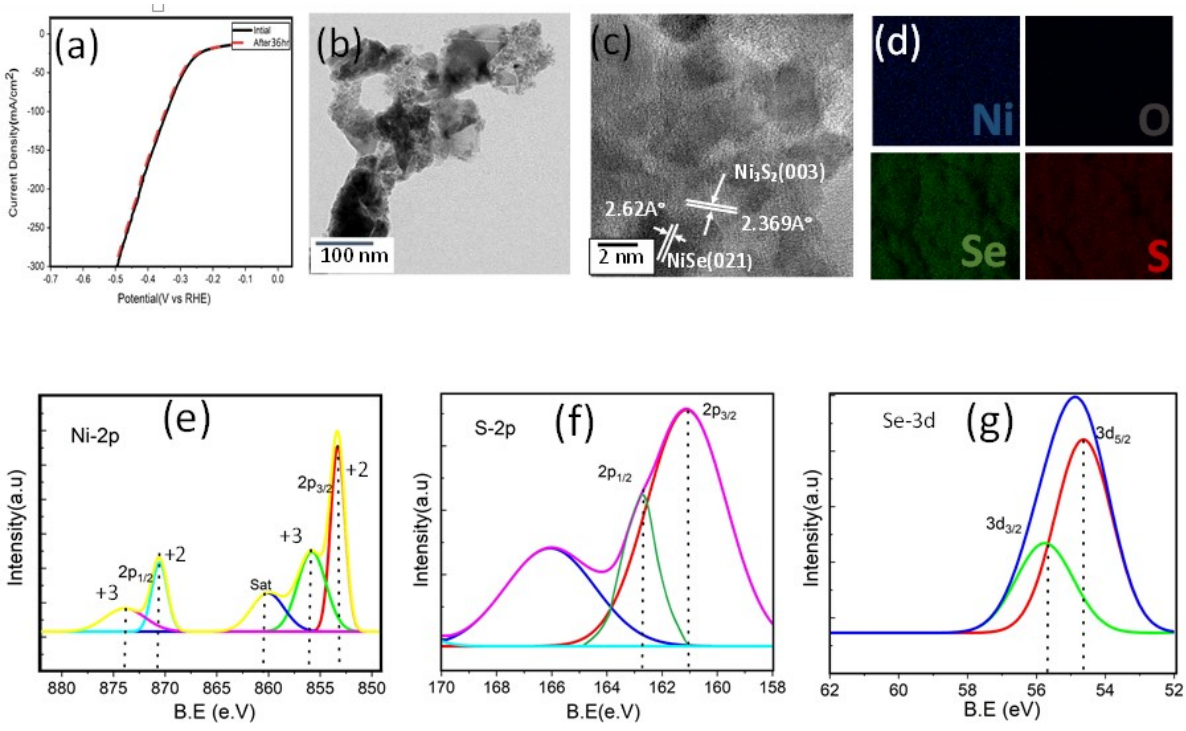

Figure S8: LSV curve before and after the stability test of 36 h of HER (a); TEM (b,c) images, EDX elemental mapping (d) and XPS spectra (e-g) after the test of NX600C.

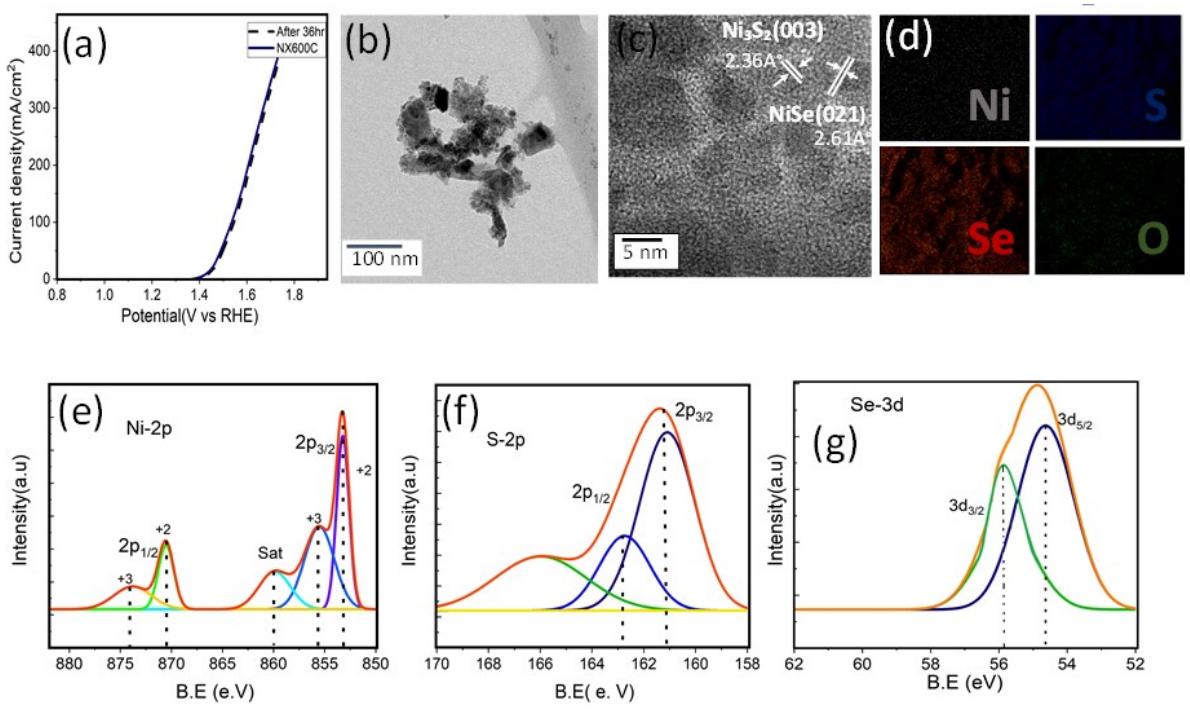

Figure S9: LSV curve before and after the stability test of 36 h of OER (a); TEM (b,c) images, EDX elemental mapping (d) and XPS spectra (e-g) after the test of NX600C.

S1. Methods of calculation of Turnover Frequency (TOF)

Turn Over Frequency accurately signifies the catalytic activity of a catalyst. The electrocatlytic performances of all our catalyst were calculated as per the previous study [1], TOF is calculated as per the below equation,

$$\text{TOF} = \frac{\text{Total hydrogen (or oxygen) turn overs/geometric area (cm}^2\text{)}}{\text{\# Surface active sites/geometric area (cm}^2\text{)}} \quad (1)$$

The Final TOF plot is obtained from the LSV curve of the electrocatalyst by the following equation

$$\text{TOF}_{\text{HER}} = \frac{3.12 \times 10^{15} \frac{\text{H}_2\text{s}^{-1}}{\text{cm}^2} \text{per} \frac{\text{mA}}{\text{cm}^2} \times |j|}{\text{\#Surface active sites} \times \text{A}_{\text{ECSA}}} \quad (2)$$

$$\text{TOF}_{\text{OER}} = \frac{1.56 \times 10^{15} \frac{\text{O}_2\text{s}^{-1}}{\text{cm}^2} \text{per} \frac{\text{mA}}{\text{cm}^2} \times |j|}{\text{\#Surface active sites} \times \text{A}_{\text{ECSA}}} \quad (3)$$

Where |j| is the current density in mA/cm^2,

$$\text{Surface active sites} = \left(\frac{\text{Atoms per unit cell}}{\text{Volume Å}^3 \text{ per unit cell}} \right)^{\frac{2}{3}} \quad (4)$$

$$A_{ECSA} = \frac{C_{dl}\text{- electrocatalyst (mF/cm}^2\text{)}}{C_{dl}\text{- NF (mF/cm}^2\text{) per ECSA cm}^2} \quad (5)$$

Table S1: WD-XRF analysis report for NX600C

Sr. No	Test Parameter	Concentration (%)
1	S	26.823
2	Ni	37.45
3	Se	35.727

Reference:

[1] He et al., (2021). *Rational Design of Vanadium-Modulated Ni_3Se_2 Nanorod@ Nanosheet Arrays as a Bifunctional Electrocatalyst for Overall Water Splitting*. ACS Sustainable Chemistry & Engineering, 9(35), 12005-12016.