Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting information

Straightforward fabrication of robust Fe–doped Ni_3Se_2 supported nickel foam as a highly efficient electrocatalyst for oxygen evolution reaction

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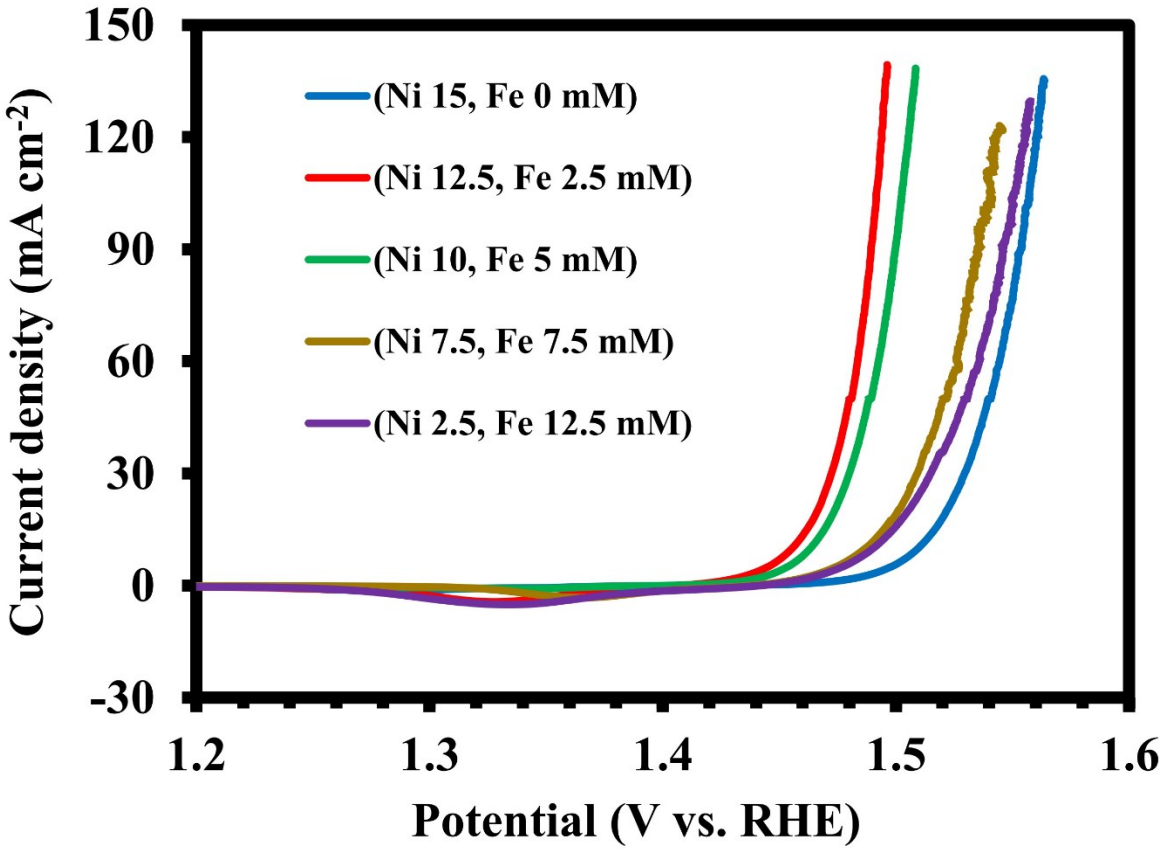

Figure S1: Polarization curves toward OER of deposited catalysts with different Ni and Fe ratio.

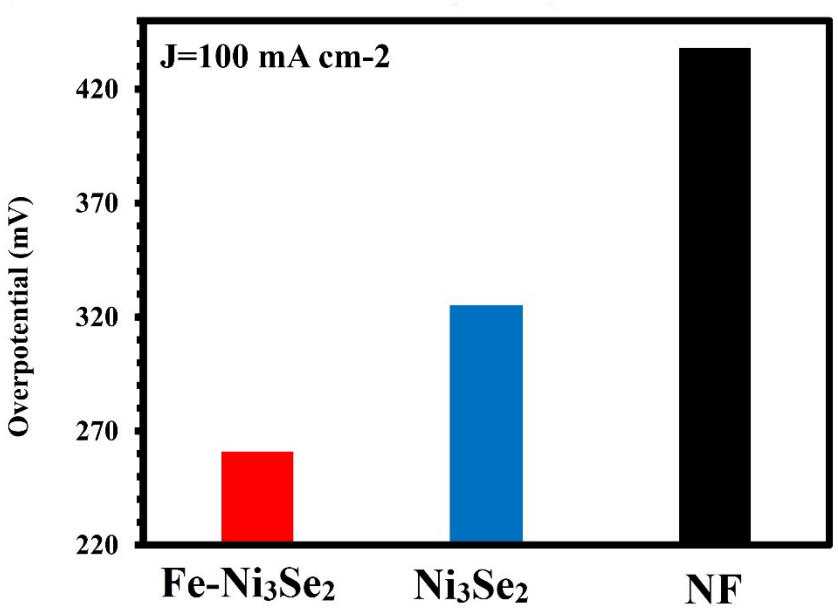

Figure S2: Overpotential required for J=100 mA cm^{-2}.

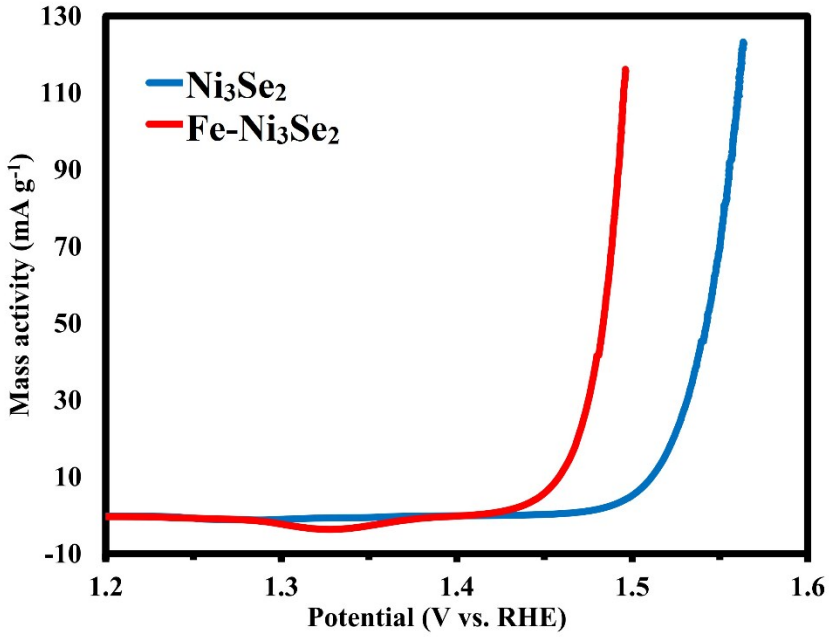

Figure S3: Mass activity for Fe-Ni_3Se_2 and Ni_3Se_2.

Table S1: OER performances of Fe-Ni_3Se_2 and other reported electrocatalysts in alkaline medium.

Material	**Substrate**	**Mass loading (mg.cm^{-2})**	**η (mV) @ J (mA cm^{-2}) in 1M KOH**	**Tafel slope**	**Binder Free**	**References**
Fe-Ni_3Se_2	**NF**	**1.2**	**225@10 251@50 261@100**	**35.3**	**Yes**	**Present Work**
Au25/$CoSe_2$	GC	0.2	430@10 (0.1 M KOH)	79.6	No	***J. Am. Chem. Soc*, 2017**, 1393,1077-1080
O-$CoSe_2$-HNT	GC	-	252@10	62	No	***J. Mater. Chem. A* 2019**, 7 (25), 15073-15078
$CoSe_2$ UNM_{vac}	GC	0.28	284@10	46.3	No	***J. Mater. Chem. A*, 2019**,7, 2536-2540
$CoSe_2$/ZnSe	GC	-	320@10	66	No	***ACS Nano*, 2019**,1355635-5645
Ni-Co-S-Se Alloy Nanocrystals	FTO	0.1	358@10	64	Yes	***ACS Appl. Nano Mater.*,2018**1,105753-5762
Fe–NiSe	NF		233 @10 275@50	48	Yes	***J. Mater. Chem. A*, 2017**,5, 14639-14645
$(Ni_{0.77}Fe_{0.23})Se_2$	CFC	-	228@10	69	Yes	***J. Mater. Chem. A*, 2019**,7, 2831-2837
(Co,Ni)Se_2@NiFe LDH	GC	-	277@10	75	No	***ACS Appl. Mater. Interfaces*, 2019**, 1188106-8114
Fe-$NiSe_2$ Hollow Spheres	GC	0.2	231@10	83	No	***ACS Appl. Energy Mater.*, 2019**, DOI: 10.1021/acsaem.9b00337
Fe -$NiSe_2$	GC	0.2	268@10 (0.1 M KOH)	41	No	***Angew. Chem*., 2018**, 57, 4020-4024.
Fe-NiSe	NF	3.1	231@50 254@200	43	Yes	***J. Mater. Chem. A*, 2019**, 7 , 2233-2241
Fe-$NiSe_2$	XC-72	0.45	227@10	37.87	No	***Nanoscale***, **2017**, 9, 6821.
Fe,Co-$NiSe_2$	CFC	-	251@10	63	Yes	***Adv. Mater*., 2018**, 30 (35), 1802121
Fe-doped Ni_3Se_4	GC	0.673	225@10	41	No	***Nanoscale,* 2018**, 10 (11), 5163-5170
$(Ni_{0.75}Fe_{0.25})Se_2$	CFC	1.5	255@35	47.2	Yes	***ACS. Appl. Mater. interface* , 2016**, 8 (30), 19386-19392
Ni–Fe mixed diselenide nanocages	GC	0.1	240@10 270@100	24	No	***Adv. Mater*., 2017**, 29 (41), 1703870
$NiSe_2$/$FeSe_2$	GC	0.45	235@10	34.7	No	***Catalysis Science & Technology,* 2017**, 7 (20), 4604-4608

$Ni_xFe_{1-x}Se_2$	NF	4.1	195@10	28	Yes	***Nat. comm*.., 2016,** 7, 12324
$FeSe_2$	nickel piece	0.01	330@10	48.1	No	***Nano Energy*, 2017**, 31, 90-95
Ni_3Se_2	NF Au@Glass	0.21	270@10 290@10 (0.3 M KOH)	142.8 97.2	Yes	***Energy Environ. Sci*., 2016**,9, 1771-1782
$NixCo_{1-x}Se2$ hollow microparticles	FTO	0.072	320@10	78	No	***Chem.Mater*.2017**, 29167032-7041
Ni-Co-S-Se	FTO	0.1	272@10	76	No	***ACS Appl. Nano Mater.*, 2018**, 1105753-5762
$(Co_{0.21}Ni_{0.25}Cu_{0.54})_3Se_2$	Au-coated glass	-	272@10	53.3	Yes	***J. Mater. Chem. A*, 2019**,7, 9877-9889
$(Fe_{0.48}Co_{0.38}Cu_{0.14})Se$	Au-coated glass	-	256@10	40.8	Yes	***ACS Sustain. Chem.Eng.*, 2019**,7109588-9600
3D $NiCoSe_2$	NF	-	183	97	Yes	***ACS Sustain. Chem. Eng*., 2018**, 667735-7742
Ni_3Se_2 film	CFC	3	340@50	80	Yes	***Catal. Sci. Technol.*, 2015**,5, 4954-4958
Co-doped $NiSe_2$ nanoparticles Film	Ti	1.67	320@100	94	Yes	***Nanoscale*, 2016**,8, 3911-3915
$NiCoSe_2$	CFC	1.6	255.8@10	71	Yes	***J. Mater. Chem. A*, 2018**,6, 17353-17360
$NiSe_2$ pyramids	N-doped G@NF	2.5	307@20 0.1 M	89	Yes	***J. Mater. Chem. A*, 2017**,5, 3981-3986
CoOx–CoSe film	NF	3.5	300@100	68	Yes	***J. Mater. Chem. A*, 2016**,4, 10933-10939
Co_7Se_8	Au@Glass	-	260@10	32.6	Yes	***ACS Appl. Mater. Interfaces,* 2016**82717292-17302
$NiSe_2$	Ti	2.5	295@20	82	Yes	***ACS Appl. Mater. Interfaces*, 2016**874718-4723
$NiSe_2$	NF	2.3	279@20	97	Yes	***CrystEngComm*, 2018**,20, 3344-3352
Fe-Ni_3S_2	NF	-	320@20	71	Yes	***Nanoscale*, 2019**,11, 2355-2365
CoOOH-NS	CFC	2	253@10	87	No	***Energy Environ. Sci*., 2019**,12, 739-746
$Co_2(OH)_3Cl$	GC	0.142	270@10	155	No	***Adv. Mater*. 2019**, 31, 1805127
NiS microsphere film	NF	43	335@50	89	Yes	***Chem. Commun*., 2016**,52, 1486-1489
Ni_3S_4	GC NF	0.5 3	257@10 300@50	67	No	***Adv. Funct. Mater*., 2019**, 29 (18), 1900315.
N doped-Ni-	GC	0.2	284.7@10	56	No	***Small,* 2019**, 15 (18),

Ni3S2@Carbon						1900348
VOx/Ni_3S_2	NF	1.5	330@100	82	Yes	***J. Mater. Chem. A*, 2019**,7, 10534-10542
$Co_xNi_{1-x}S_2$	GC	0.285	290@10	46	No	***J. Mater. Chem. A***, 2019,7, 3592-3602
$NiCo_2O_3$@OMC	GC	0.567	281@10	96.8	No	**Appl. Catal. B, 2019**, 256, 117852.
NiCeOx	NF	-	295@10	66	Yes	***ACS Catal*., 2019**, 921605-1611
$CoFe_2O_4$	GC	0.36	275@10	42.1	No	***J. Mater. Chem. A, 2019***,7, 7328-7332
Ni-Doped CuS	GC	-	390@10 (0.5M KOH)	96.8	No	***Catal. Sci. Technol.*, 2019**,9, 406-417

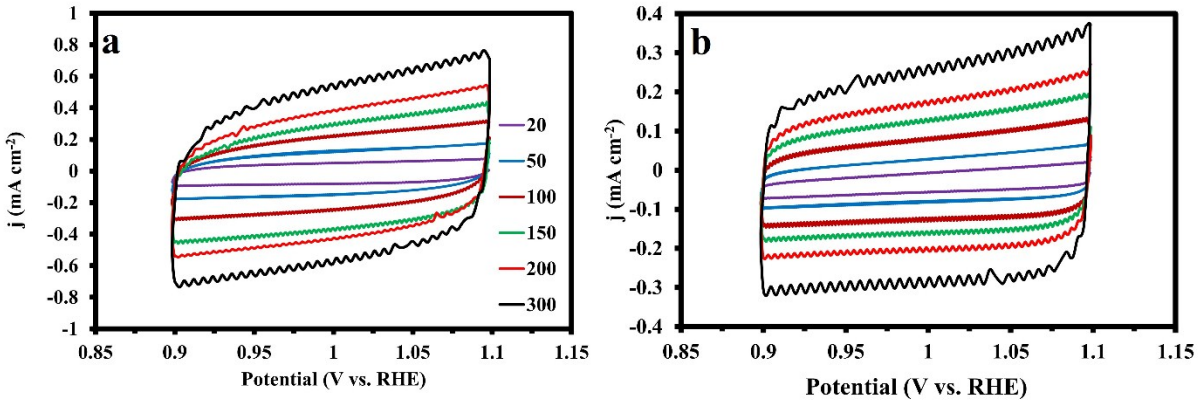

Figure S4: Plot of the difference in double layer charging current vs. scan rates a) Fe-Ni_3Se_2. b) Ni_3Se_2.

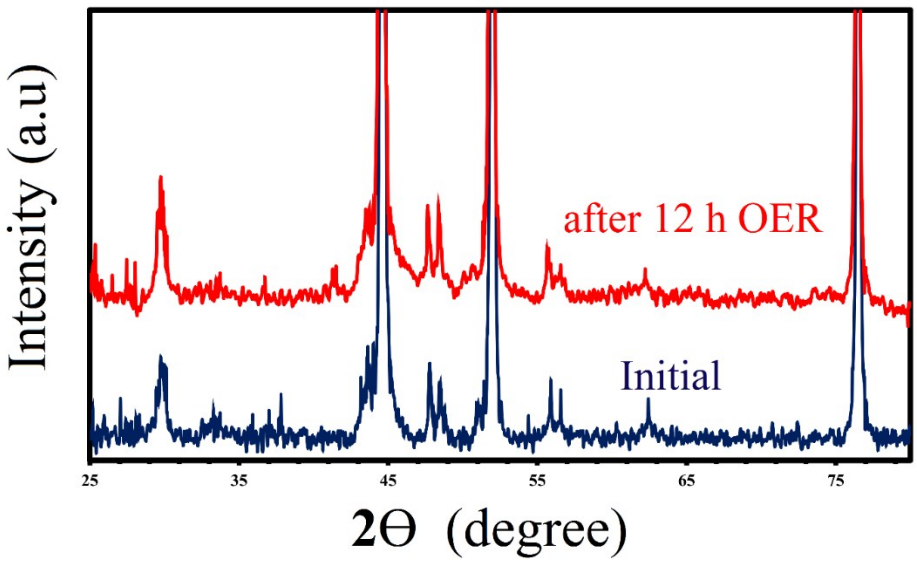

Figure S5: XRD patterns of Fe-Ni_3Se_2 recorded before and after 12 hours OER stability test.

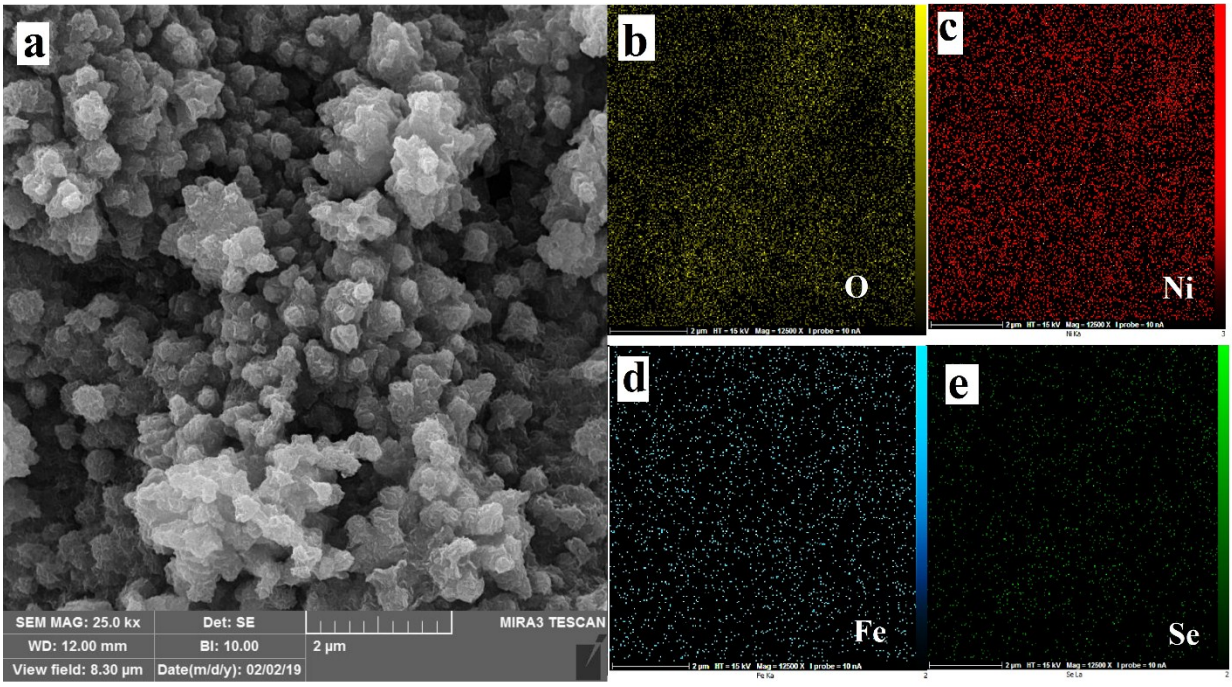

Figure S6: a) SEM images of the Fe-Ni_3Se_2/NF electrode after 12 hours OER stability test. EDS elemental mapping of the Fe-Ni_3Se_2/NF electrode after 12 hours OER stability test b) Oxygen, c) Ni, d)Fe and e)Se.

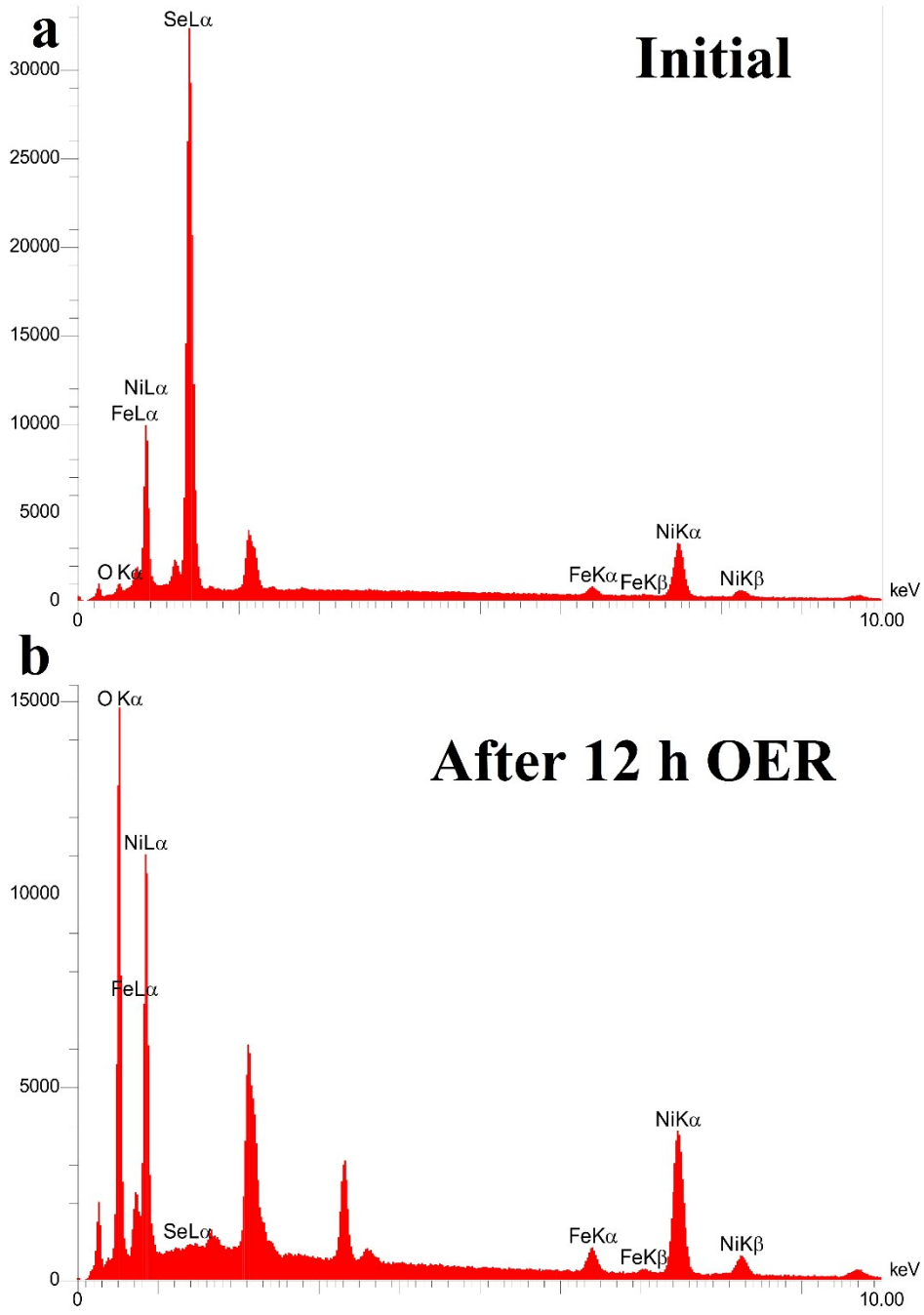

Figure S7: EDS Spectrum of a) Fe-Ni_3Se_2 and b) Fe-Ni_3Se_2 after 12 hours OER.