Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

Investigation of the stability of NiFe-(Oxy)hydroxide anodes in alkaline water electrolysis under industrially relevant conditions

Marco Etzi Coller Pascuzzi, Alex J.W. Man, Andrey Goryachev,[§] Jan P. Hofmann[$,]*, and Emiel J. M. Hensen*

Laboratory of Inorganic Materials and Catalysis, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands.

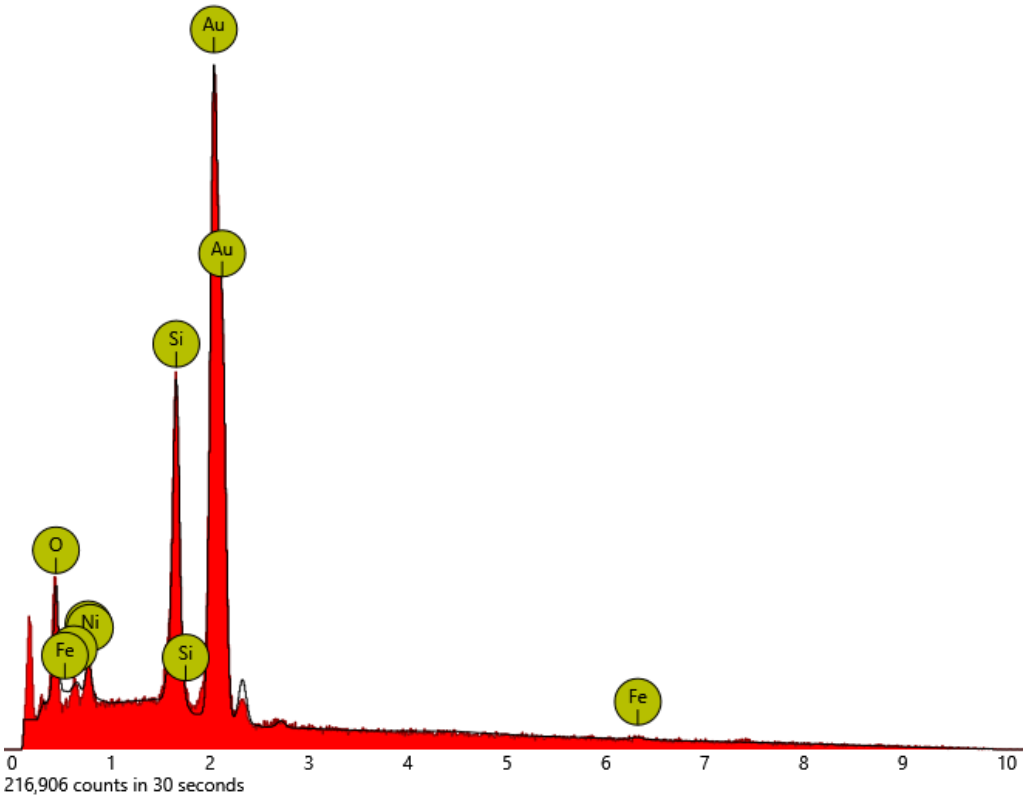
[§] Present address: *KAUST Catalysis Center, 4700 King Abdullah University of Science and Technology, Thuwal 23955-6900, Kingdom of Saudi Arabia.*

[$]Present address: *Surface Science Laboratory, Department of Materials and Earth Sciences, Technical University of Darmstadt, Otto-Berndt-Strasse 3, 64287 Darmstadt, Germany.*

Corresponding authors:

e.j.m.hensen@tue.nl (E. J. M. Hensen)

j.p.hofmann@tue.nl (J. P. Hofmann)



Element Symbol	Atomic Conc.	Weight Conc.
Au	58.9	91.6
O	18.5	2.3
Si	18.3	4.1
Ni	3.0	1.4
Fe	1.3	0.6

Figure S1. EDX analysis of as-deposited $NiFeO_xH_y$ sample.

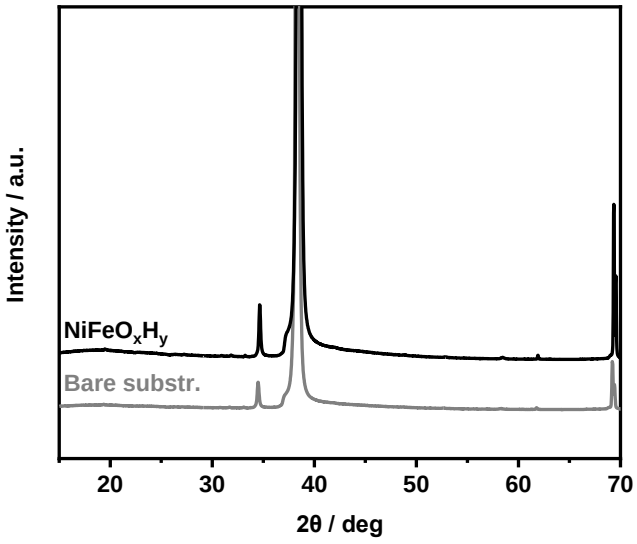


Figure S2. XRD patterns of fresh supported $NiFeO_xH_y$ sample and bare Au-coated Si substrate.

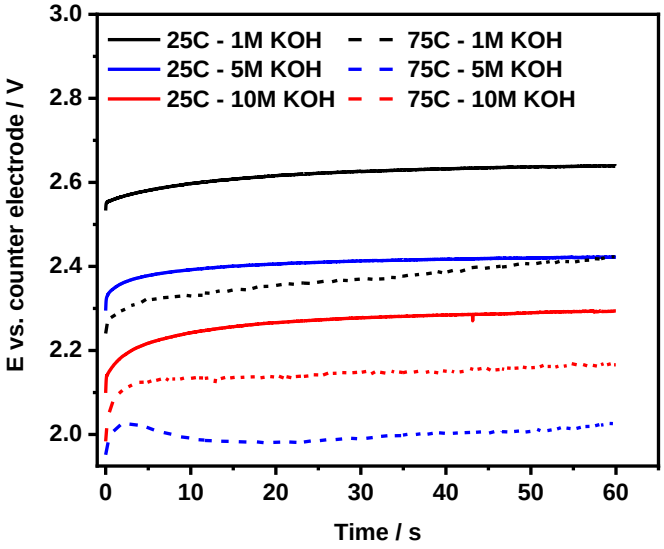


Figure S3. Chronopotentiograms of $NiFeO_xH_y$ conducted at j = 100 mA cm^{-2} at different temperatures and KOH concentrations.

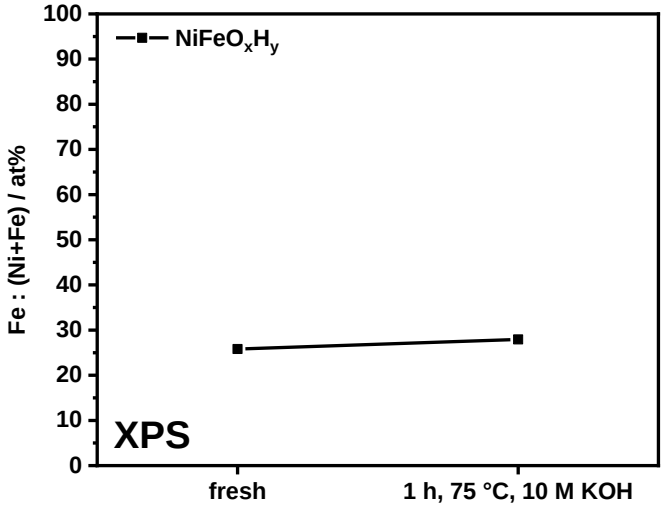


Figure S4. XPS analysis of fresh $NiFeO_xH_y$ and after 1 hour of immersion in 10 M KOH at 75 °C without anodic polarization.

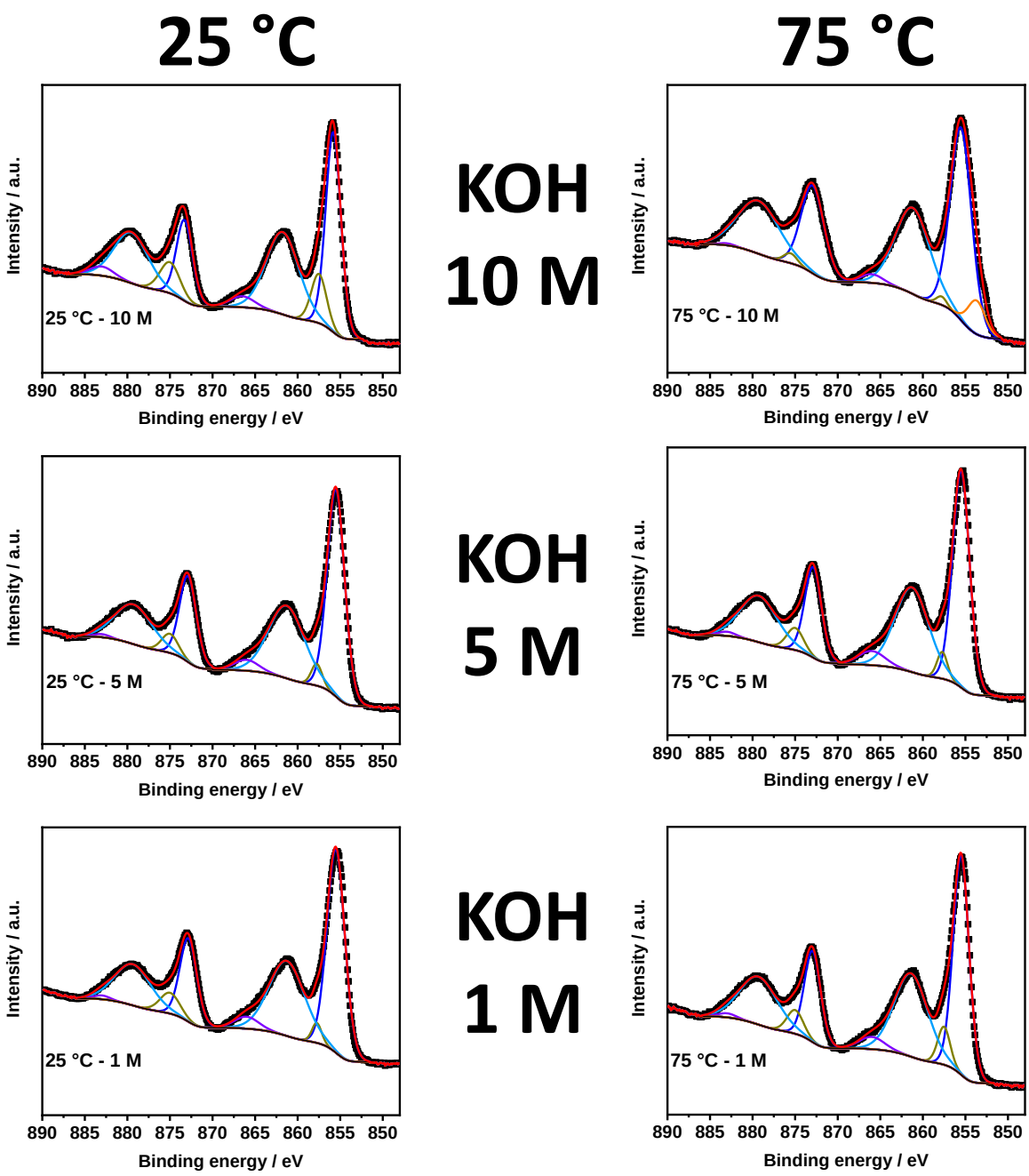


Figure S5. Ni 2p spectra of $NiFeO_xH_y$ samples after the stability tests performed under different conditions.

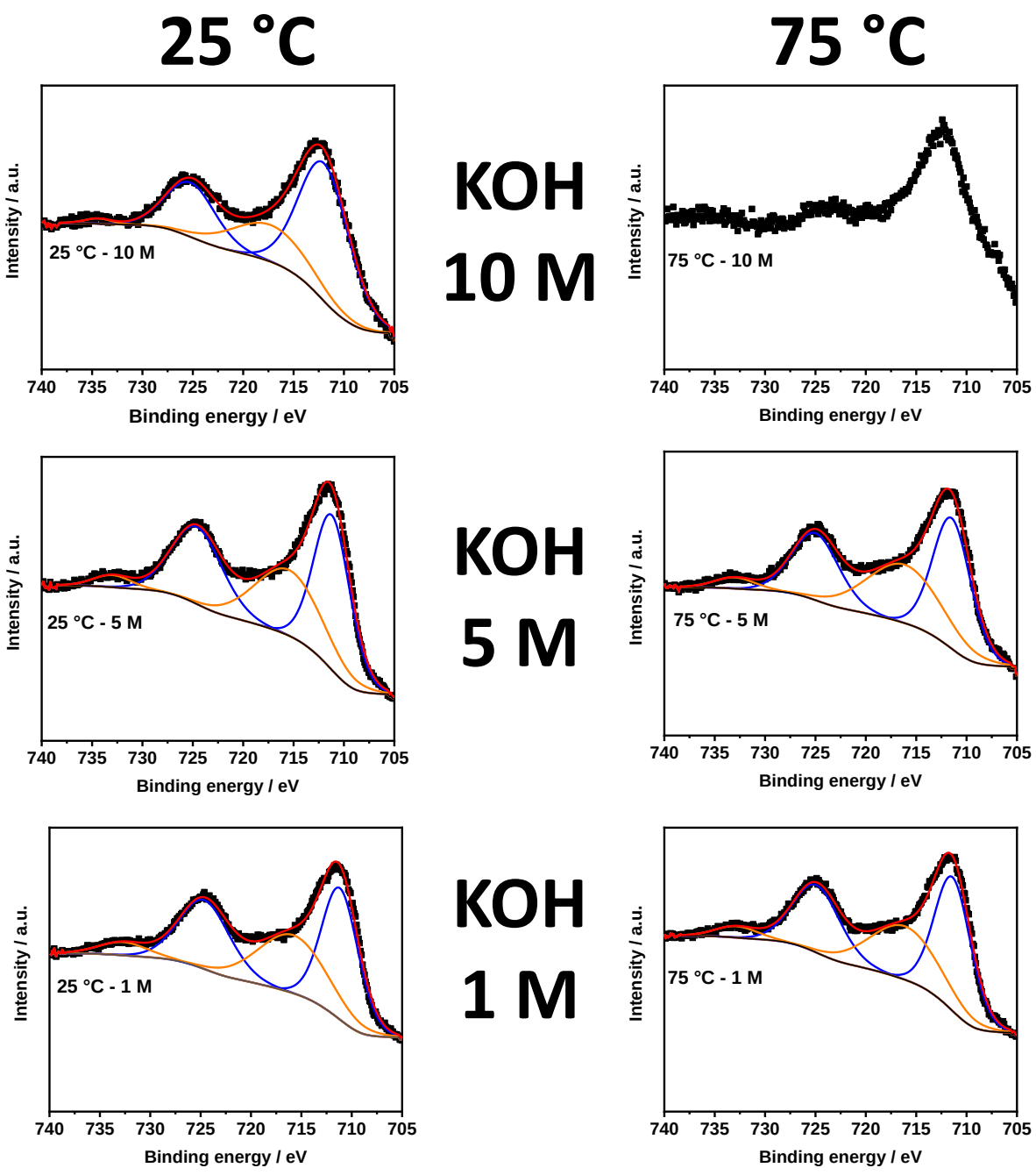


Figure S6. Fe 2p spectra of $NiFeO_xH_y$ samples after the stability tests performed under different conditions. For the sample tested at 75 °C in 10 M KOH, no peak fitting was performed, because of the strong intensity of the Ni Auger LMM feature overlapping with the weak Fe $2p_{3/2}$ peak for this low Fe-containing sample.

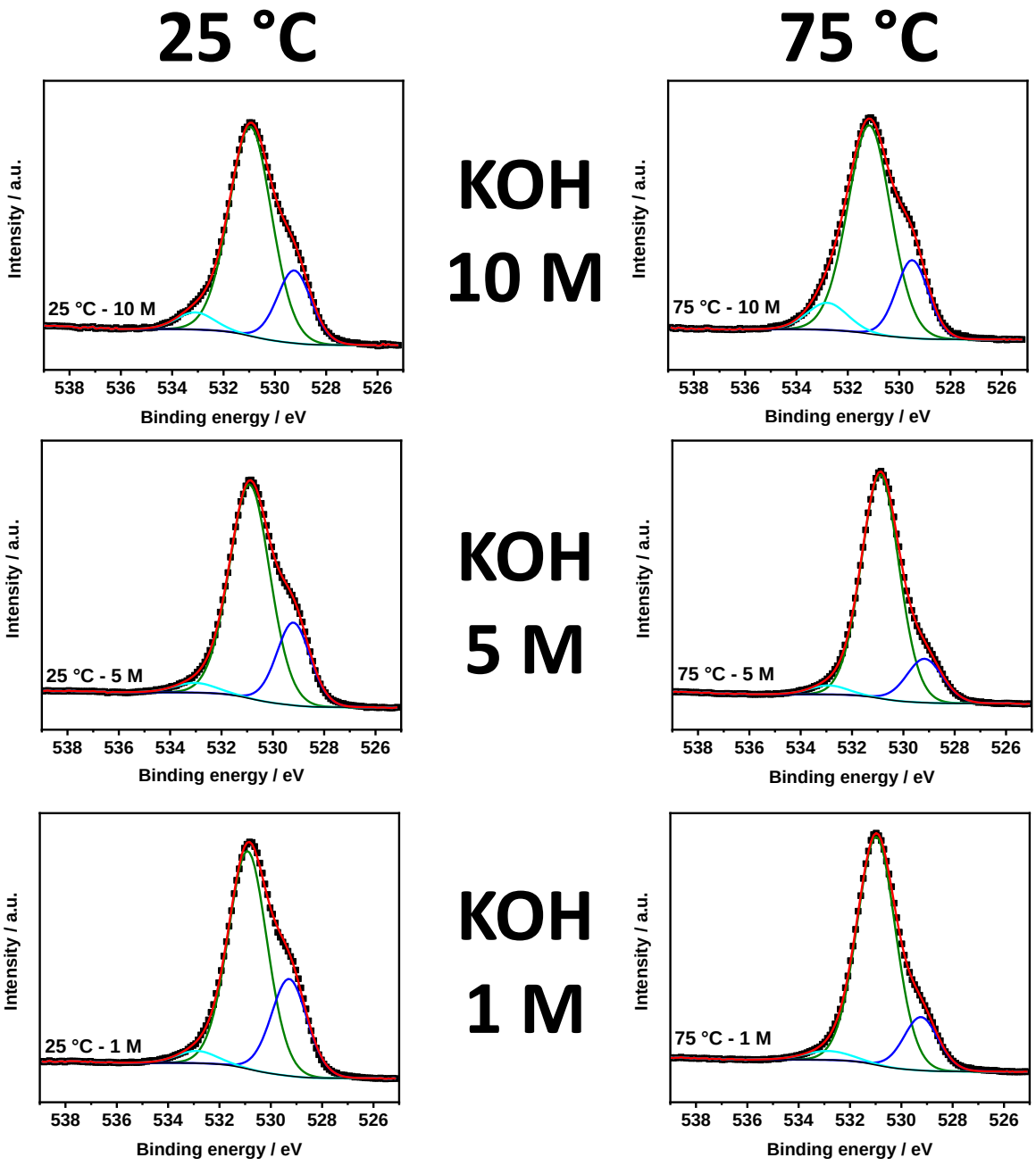


Figure S7. O 1s spectra of $NiFeO_xH_y$ samples after the stability tests performed under different conditions.

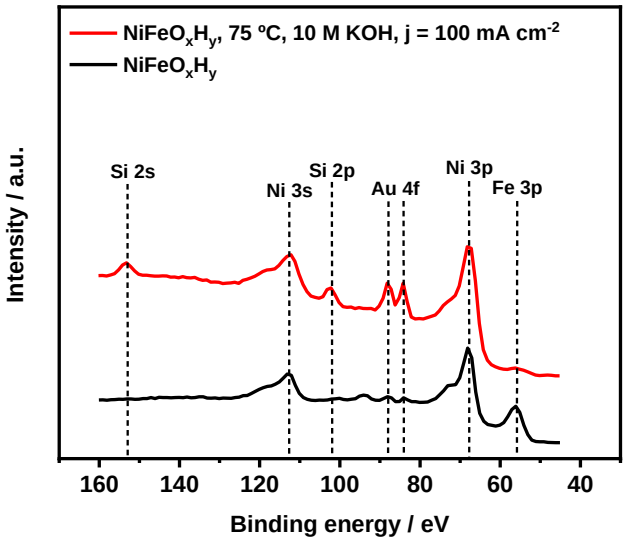


Figure S8. Low-binding energy region of XPS survey scan of $NiFeO_xH_y$ before and after anodic polarization at 75 °C in 10 M KOH, j = 100 mA cm^{-2}.

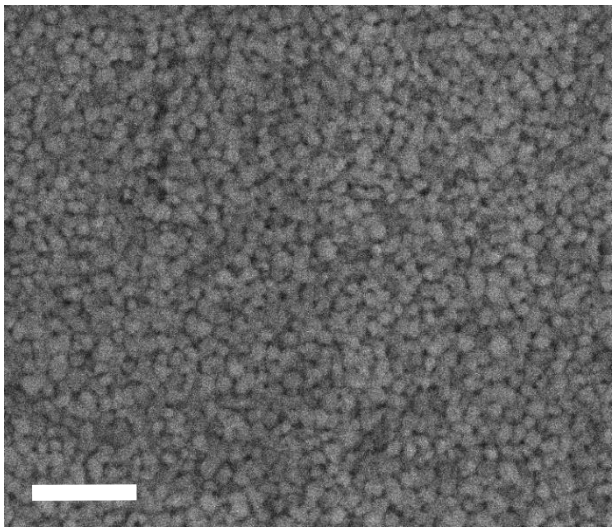


Figure S9. SEM image of the bare substrate, prior to film deposition. Scale bar is equal to 500 nm.

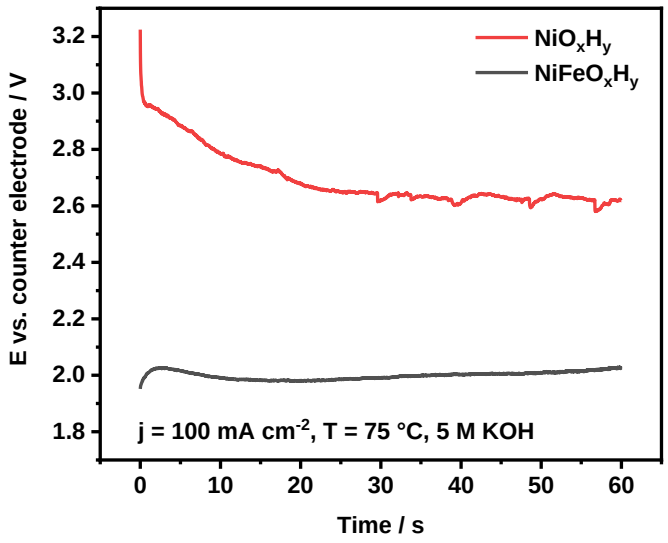


Figure S10. Chronopotentiograms of NiO_xH_y (red) and $NiFeO_xH_y$ (black) conducted at j = 100 mA cm^{-2}, 75 °C, 5 M KOH.

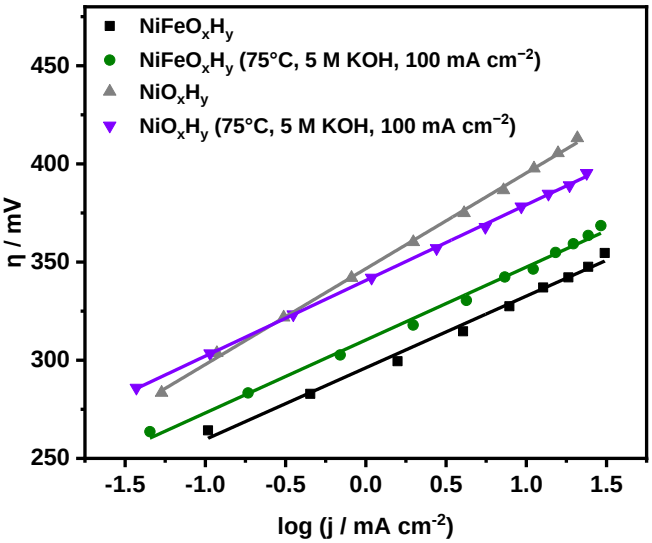


Figure S11. iR-corrected Tafel plots of NiO_xH_y and $NiFeO_xH_y$ before and after anodic polarization at 75 °C in 5 M KOH, j = 100 mA cm^{-2}. Measurements were carried out in 1 M KOH at 25 °C; the dots represent the experimental data, the lines represent the fittings.

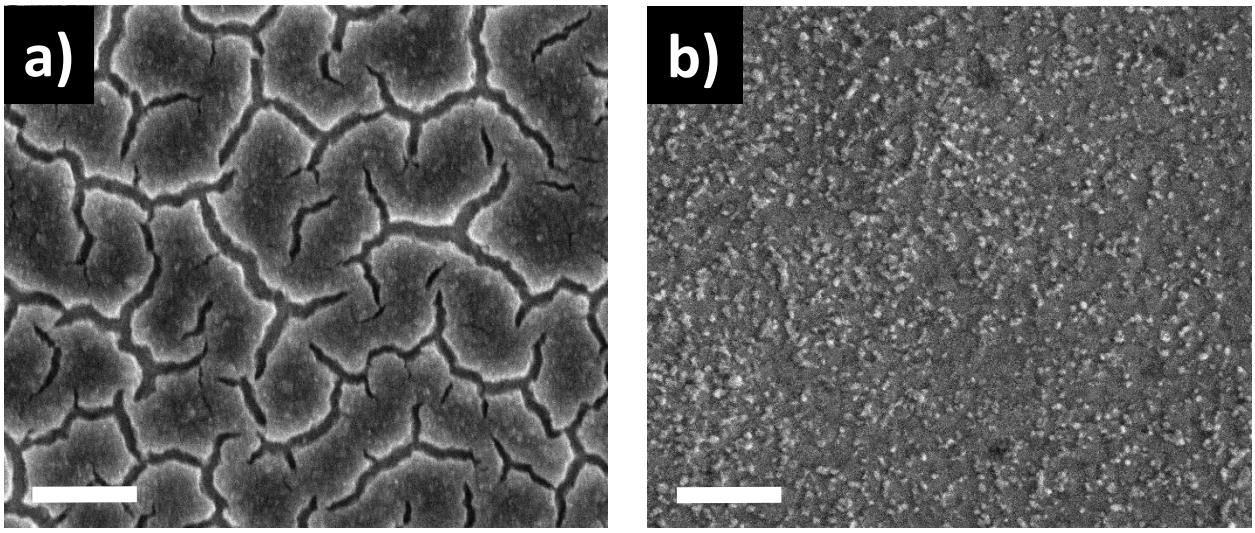


Figure S12. SEM images of NiO_xH_y a) before and b) after anodic polarization at 75 °C in 5 M KOH, j = 100 mA cm^{-2}, 1 h. Scale bars are equal to 500 nm.