Supporting information for

An electrochemical impedance study of alkaline water splitting using Fe doped NiO nanosheets

Zhen Qiu, Yue Ma[†], Gunnar A Niklasson, Tomas Edvinsson*

Department of Materials Science and Engineering, Solid State Physics, Uppsala University, Box 35, SE-75103 Uppsala, Sweden

[†]State Key Laboratory of Solidification Processing, Center for Nano Energy Materials, School of Materials Science and Engineering, Northwestern Polytechnical University, 710072 Xi'an China.

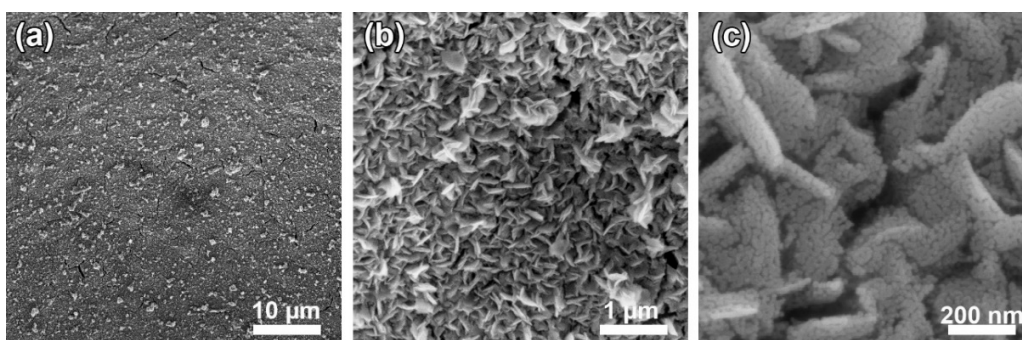*E-mail: tomas.edvinsson@angstrom.uu.se (T. E.).

Fig. S1. (a) Low and (b) high magnification SEM images of NiO nanosheets.
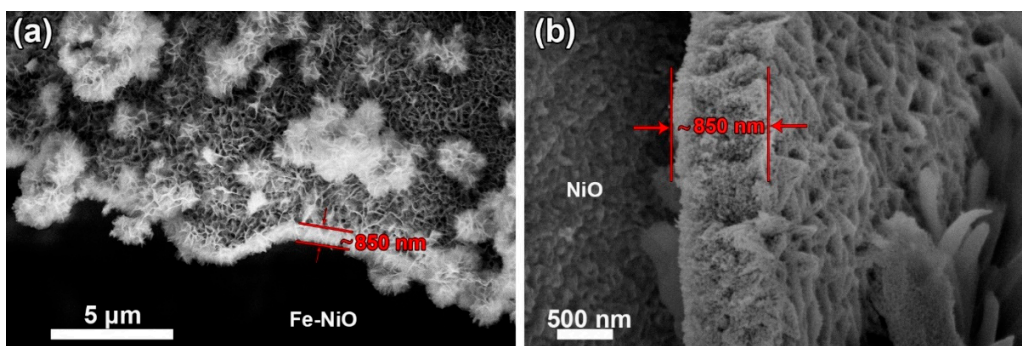

Fig. S2. The thickness of Fe-NiO nanosheets (a) and NiO nanosheets (b) measured by SEM images.
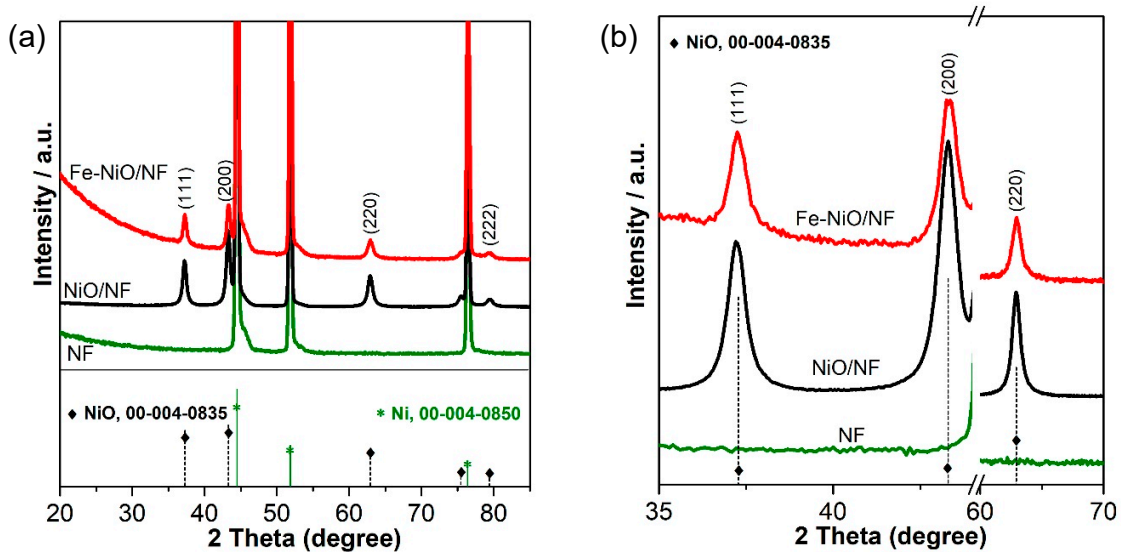
Figure S3. (a) XRD patterns of Fe-NiO and NiO nanosheets as well as the subatrate Ni foam, (b) corresponding magnified image of portions of figure (a). The lower portion of (a) depicts the diffraction patterns of fcc? Ni (ICDD 00-004-0850) and cubic NiO (ICDD 00-004-0835).
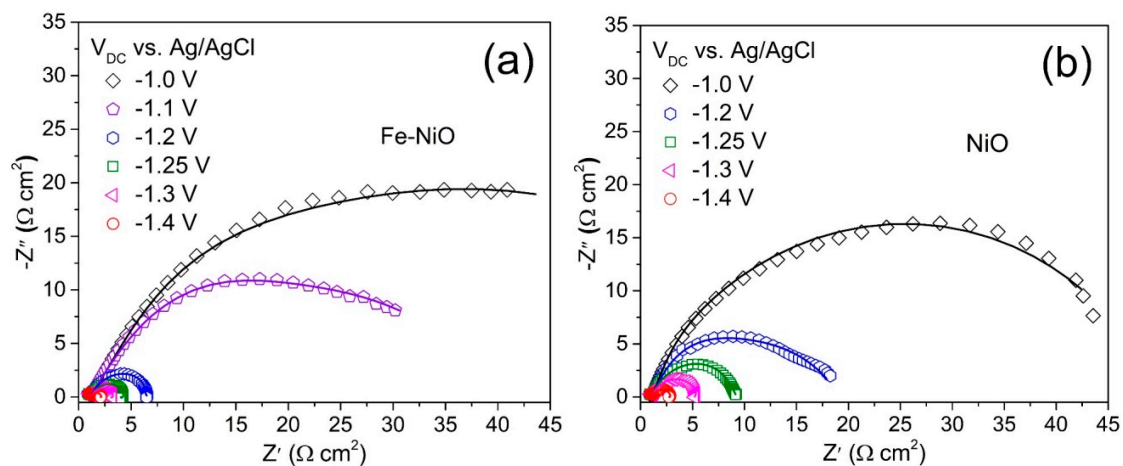

Fig. S4. EIS plots for Fe-NiO (a) and NiO (b) nanosheets at different DC potentials vs. Ag/AgCl (3 M KCl) under HER process. The symbols show the experimental points, while solid lines are the fitting curves using the EC of Fig. 2a (L-CPE). Part of the data was shown also in Fig. 3b and Fig. 3c.
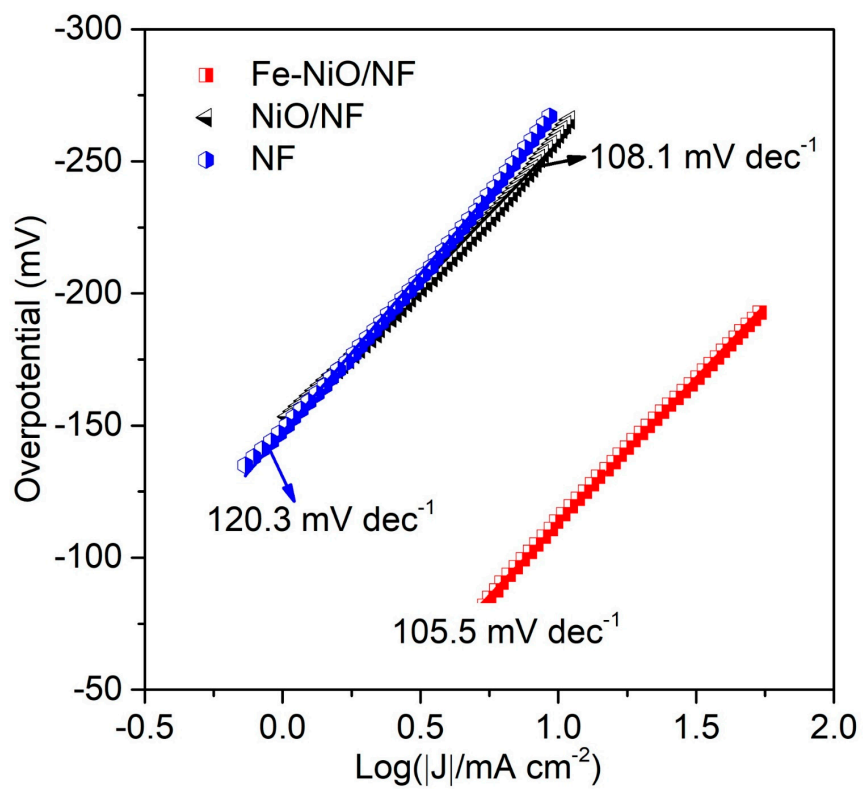
Fig. S5 The corresponding cathodic Tafel plots at a scan rate of 1 mV s^{-1} via a three-electrode configuration in 1 M NaOH aqueous elelctrolyte.
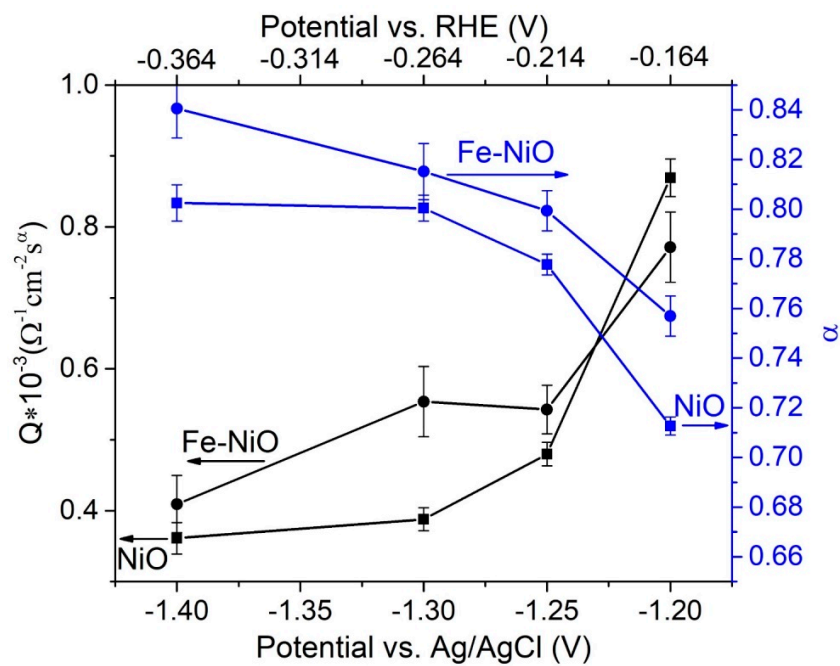
Fig. S6. The pseudo capacitance Q and exponent α of the double layer capacitance as a function ofpotential for HER.
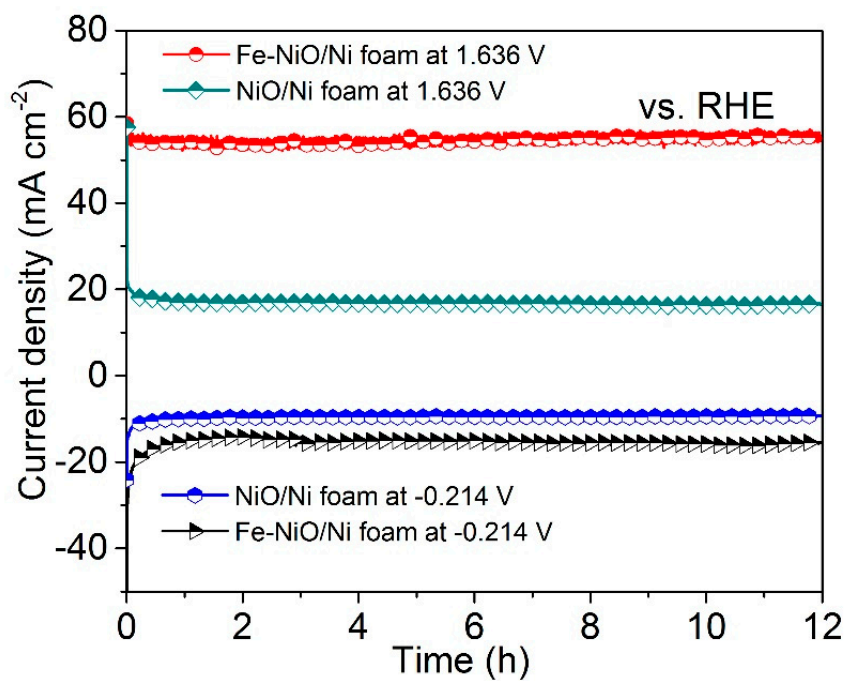

Fig. S7 J-t curves of Fe-NiO and NiO nanosheets on Ni foam at 1.636 V and −0.214 V vs. RHE for 12 h in 1 M NaOH.
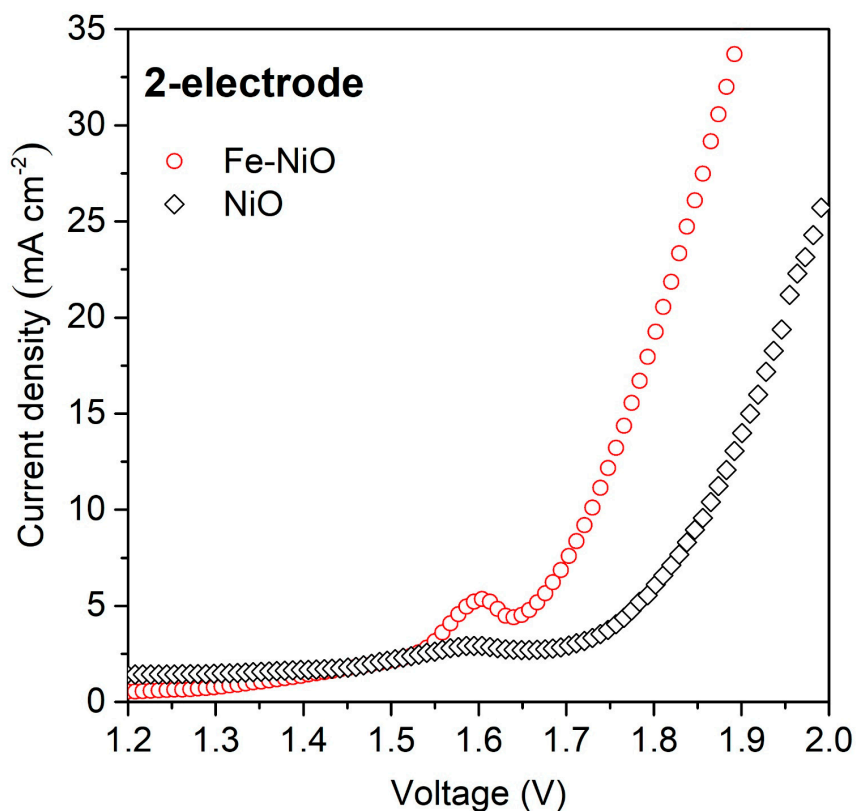
Fig. S8 Comparison of polarization curves of the overall water splitting using Fe-NiO and NiO as both anode and cathode in a two-electrode configuration at the scan rate of 1 mV s^{-1} in 1 M NaOH.

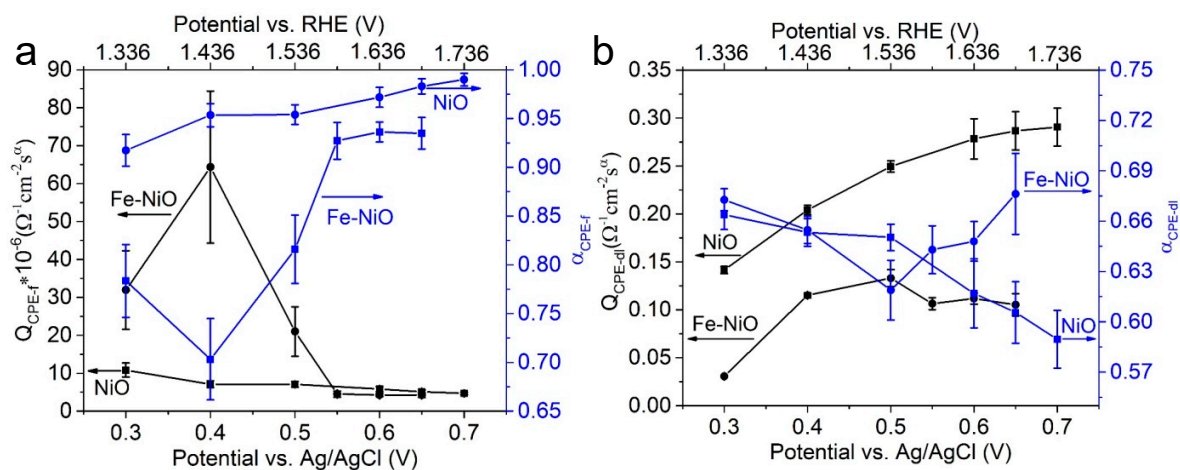

Fig. S9. The pseudo capacitance Q and exponent α of the film (a) and the double layer capacitance (b) as a function of potential for OER.
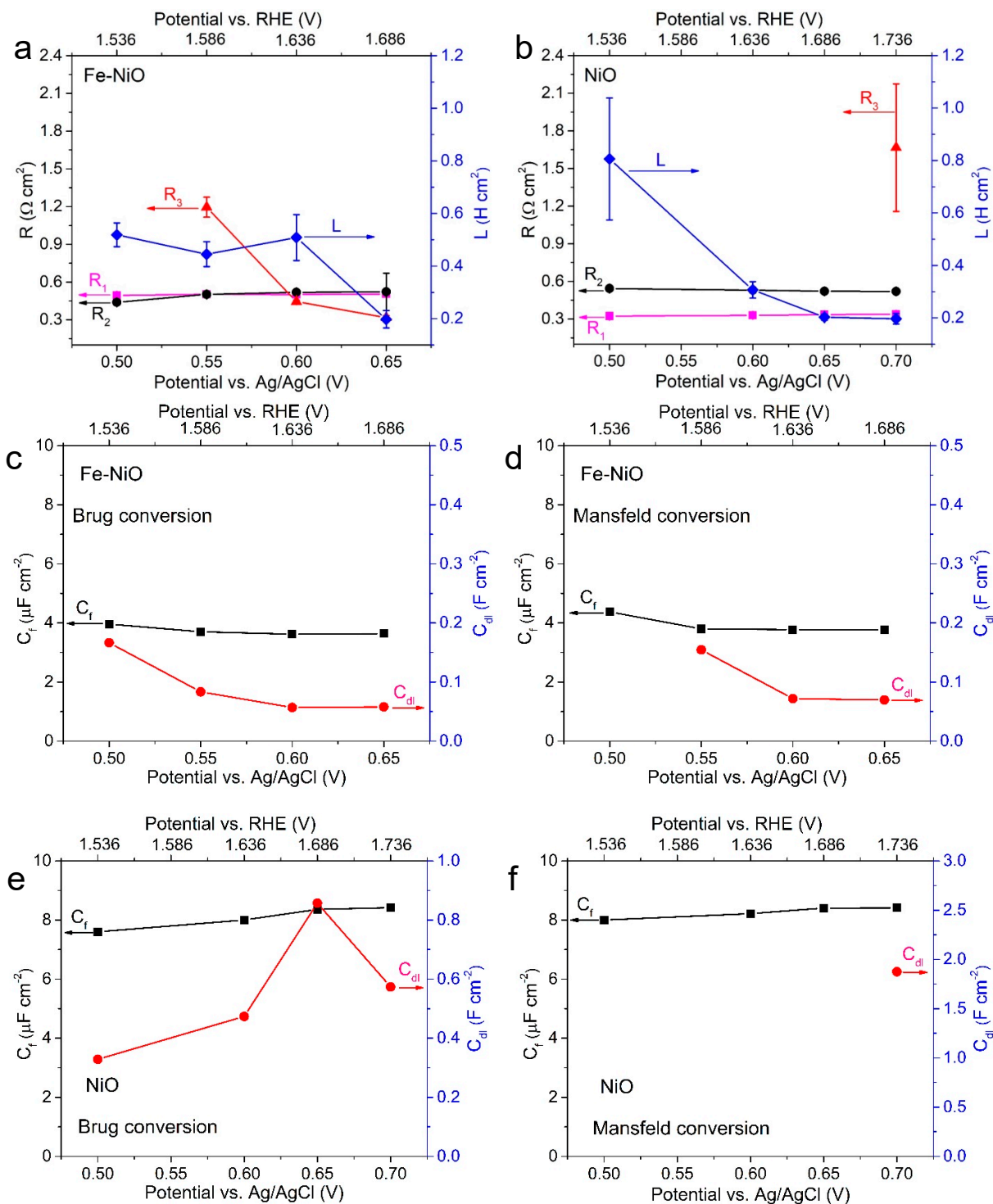
Fig. S10 Circuit element values calculated from the fits of EIS data of porous Fe-NiO and NiO films to the EC in Fig. 2a. Inductance and resistances (a, b) as well as effective equivalent capacitances (c-f) are shown as a function of applied potential. Error bars for the fit parameters are shown in (a) and (b).