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Supporting Information

of

Highly active Ni-Fe double hydroxides as anode catalysts for electrooxidation of urea

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Table S1. A list of anode catalysts with their catalytic activities for urea electrooxidation.

catalysts	test conditions	catalytic activities	references
NiFe DH/CFC	chronoamperometric analysis at 0.5 V vs. Ag/AgCl in 1 M NaOH + 0.33 M urea	~95 mA cm^{-2} mg^{-1}	this work
$Ni(OH)_2$/CFC	chronoamperometric analysis at 0.5 V vs. Ag/AgCl in 1 M NaOH + 0.33 M urea	~8 mA cm^{-2} mg^{-1}	this work
$Ni(OH)_2$ nanoribbons	chronoamperometric analysis at 0.5 V vs. Hg/HgO in 5 M KOH + 0.33 M urea	~3 mA cm^{-2} mg^{-1}	Wang *et al.*[S1]
$Ni(OH)_2$ nanotubes/NF	chronoamperometric analysis at 0.5 V vs. SCE in 1 M KOH + 0.33 M urea	~55 mA cm^{-2} mg^{-1}	Ji *et al.*[S2]
porous Ni/ carbon sponge	chronoamperometric analysis at 0.45 V vs. Ag/AgCl in 5 M NaOH + 0.1 M urea	~100 mA cm^{-2}	Ye *et al.*[S3]
mesoporous NiO/NF	chronoamperometric analysis at 0.5 V vs. SCE in 1 M KOH + 0.33 M urea with stir	~300 mA cm^{-2} mg^{-1}	Wu *et al.*[S4]
$LaNiO_3$	chronoamperometric analysis at 0.45 V vs. Hg/HgO in 5 M KOH + 0.33 M urea	reduce from 600 to 150 mA mg^{-1}	Forslund *et al.*[S5]
NiMn/carbon nanofibers	chronoamperometric analysis at 0.6 V vs. Ag/AgCl in 1 M KOH + 2 M urea	~0.16 mA cm^{-2} mg^{-1}	Barakat *et al.*[S6]
$Ni_{1.5}Mn_{1.5}O_4$	chronoamperometric analysis at 0.5 V vs. Ag/AgCl in 1 M KOH + 0.33 M urea	~18 mA cm^{-2}	Periyasamy *et al.*[S7]
$Ni(OH)_2$ nanocup	chronoamperometric analysis at 0.41 V vs. SCE in 1 M KOH + 0.33 M urea	~33 mA cm^{-2} mg^{-1}	Wu *et al.*[S8]
Ni nanowire	chronoamperometric analysis at 0.55 V vs. Hg/HgO in 1 M KOH + 0.33 M urea	reduce from 15 to 7 mA cm^{-2}	Yan *et al.*[S9]
Ni-WC/C nanocluster	chronoamperometric analysis at 0.5 V vs. Hg/HgO in 1 M KOH + 0.33 M urea	~100 mA cm^{-2} mg^{-1}	Wang *et al.*[S10]
Ni nanowire	chronoamperometric analysis at 0.5 V vs. Ag/AgCl in 5 M KOH + 0.33 M urea	~60 mA cm^{-2}	Guo *et al.*[S11]
NiCo nanowires	chronoamperometric analysis at 0.55 V vs. Hg/HgO in 1 M KOH + 0.33 M urea	~6 mA cm^{-2}	Yan *et al.*[S12]

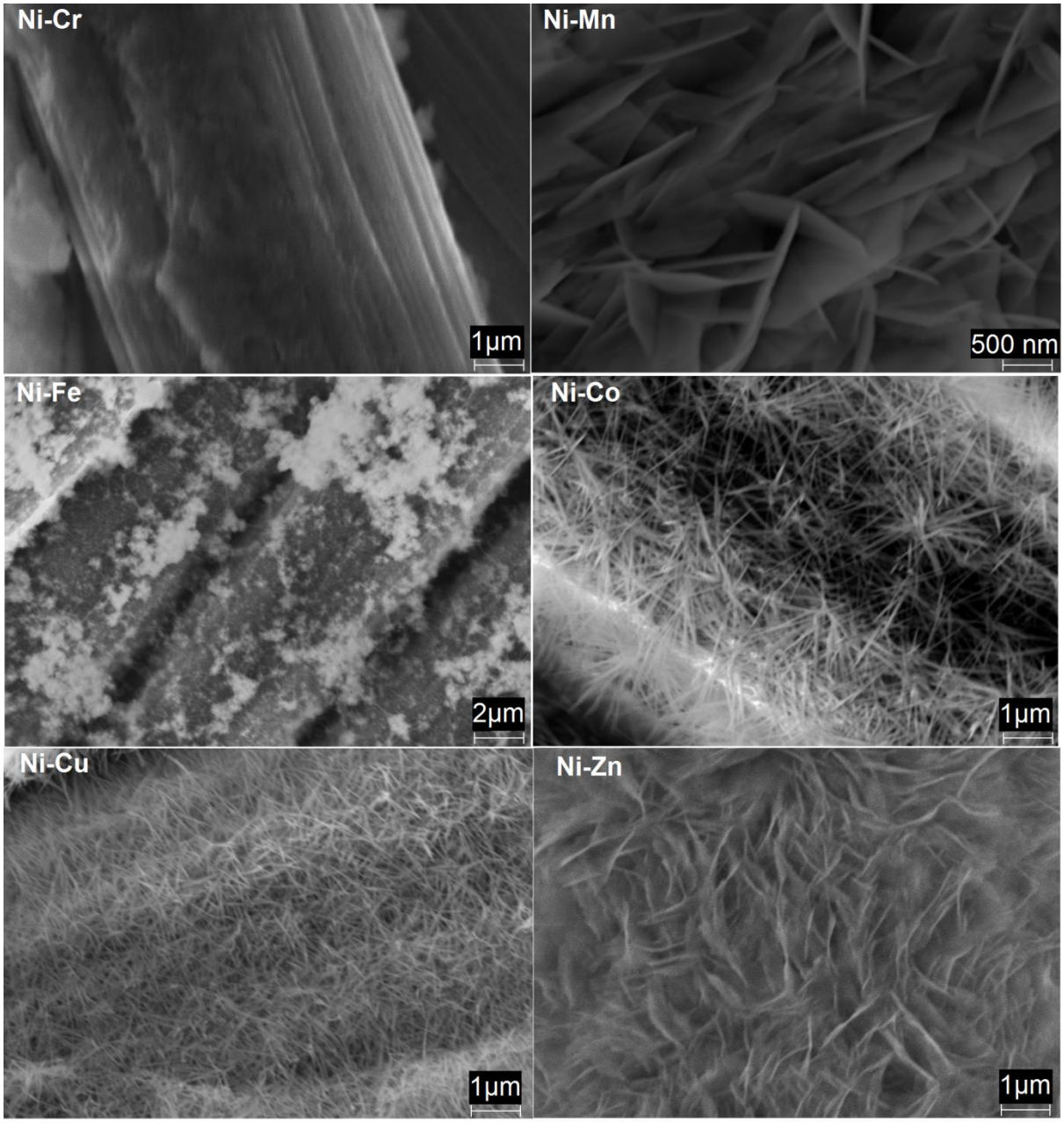

Figure S1. SEM images of Ni-Cr, Ni-Mn, Ni-Fe, Ni-Co, Ni-Cu and Ni-Zn double hydroxides on CFC.

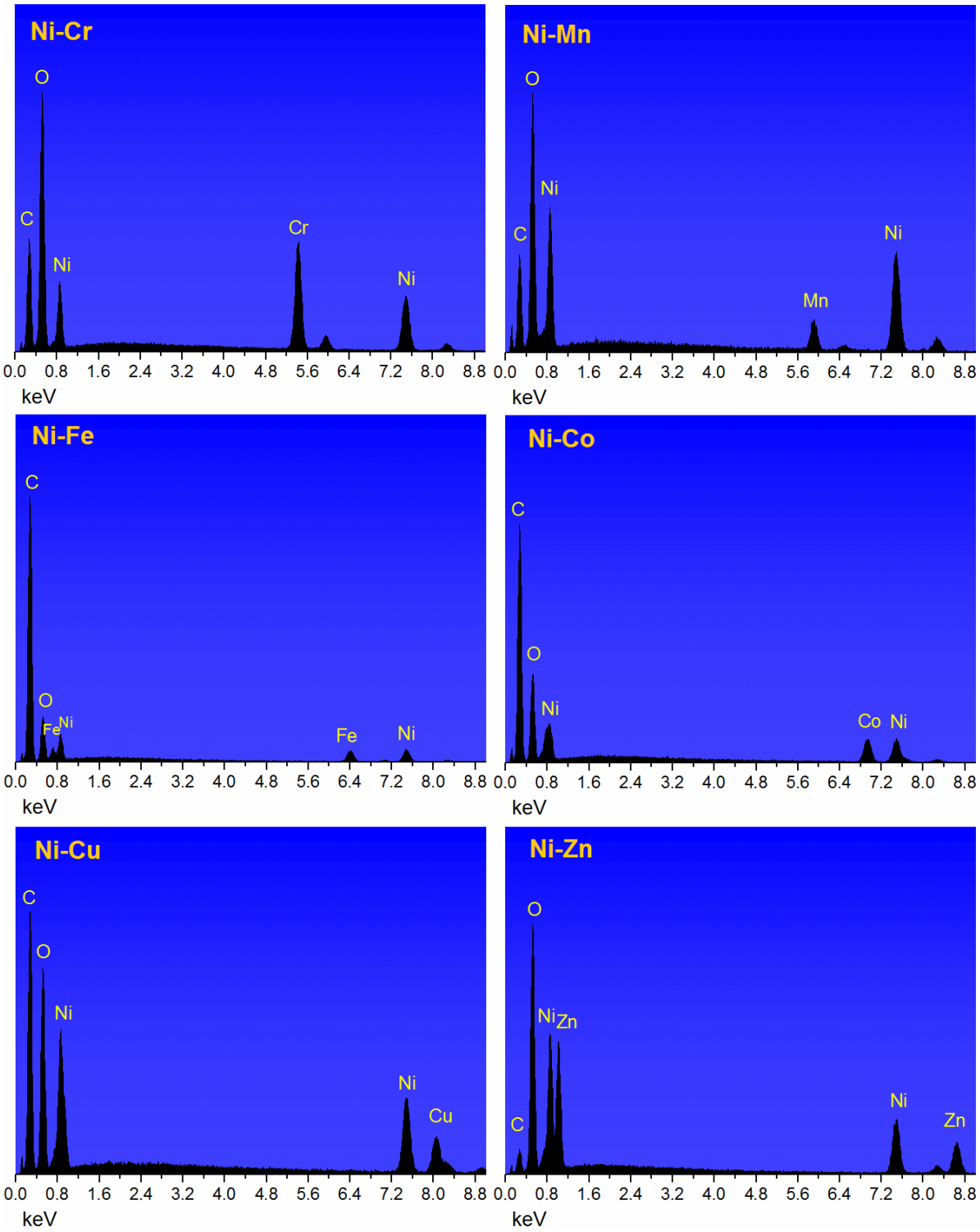

Figure S2. Energy disperse spectroscopy (EDS) of Ni-Cr, Ni-Mn, Ni-Fe, Ni-Co, Ni-Cu and Ni-Zn double hydroxides on CFC.

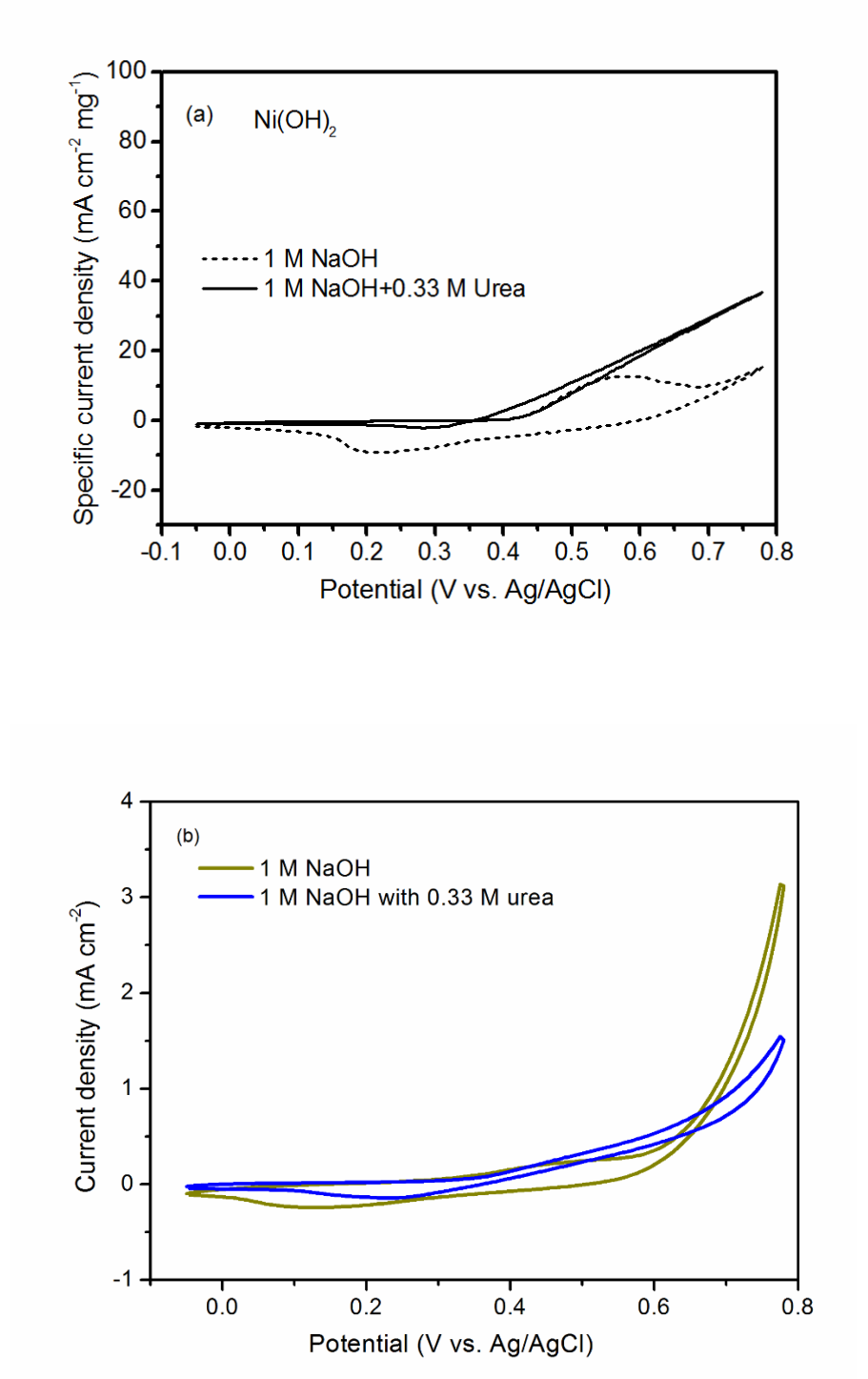

Figure S3. CVs of (a) Ni hydroxide on CFC and (b) bare CFC in 1 M NaOH with and without 0.33 M urea at scan rate of 25 mV s^{-1}.

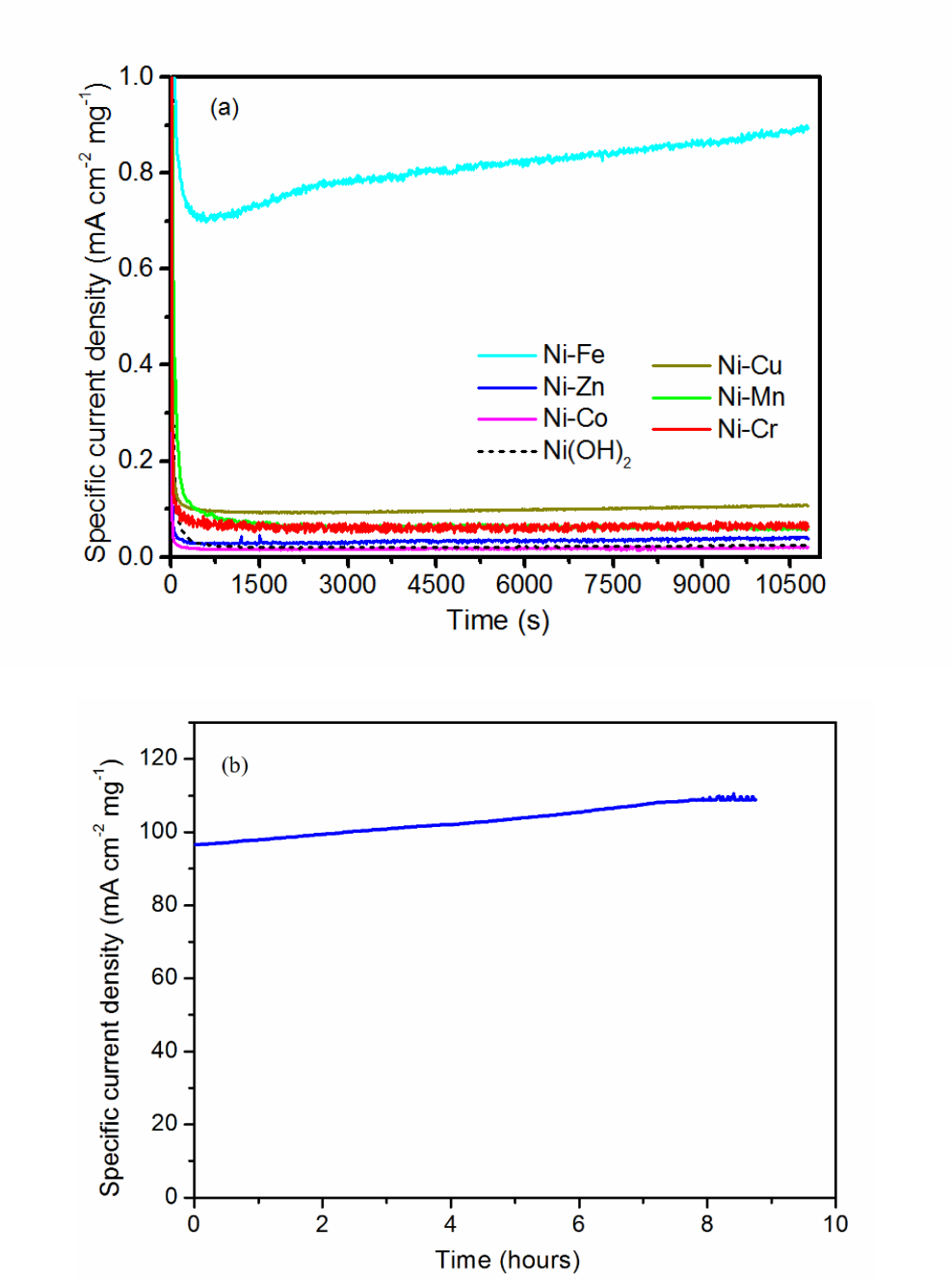

Figure S4. Chronoamperometric analysis of (a) Ni-M double hydroxides and $Ni(OH)_2$ on CFC in 1.0 M NaOH; (b) $Ni_{0.6}Fe_{0.4}$ DH in 1.0 M NaOH + 0.33 M urea at 0.5 V (vs. Ag/AgCl).

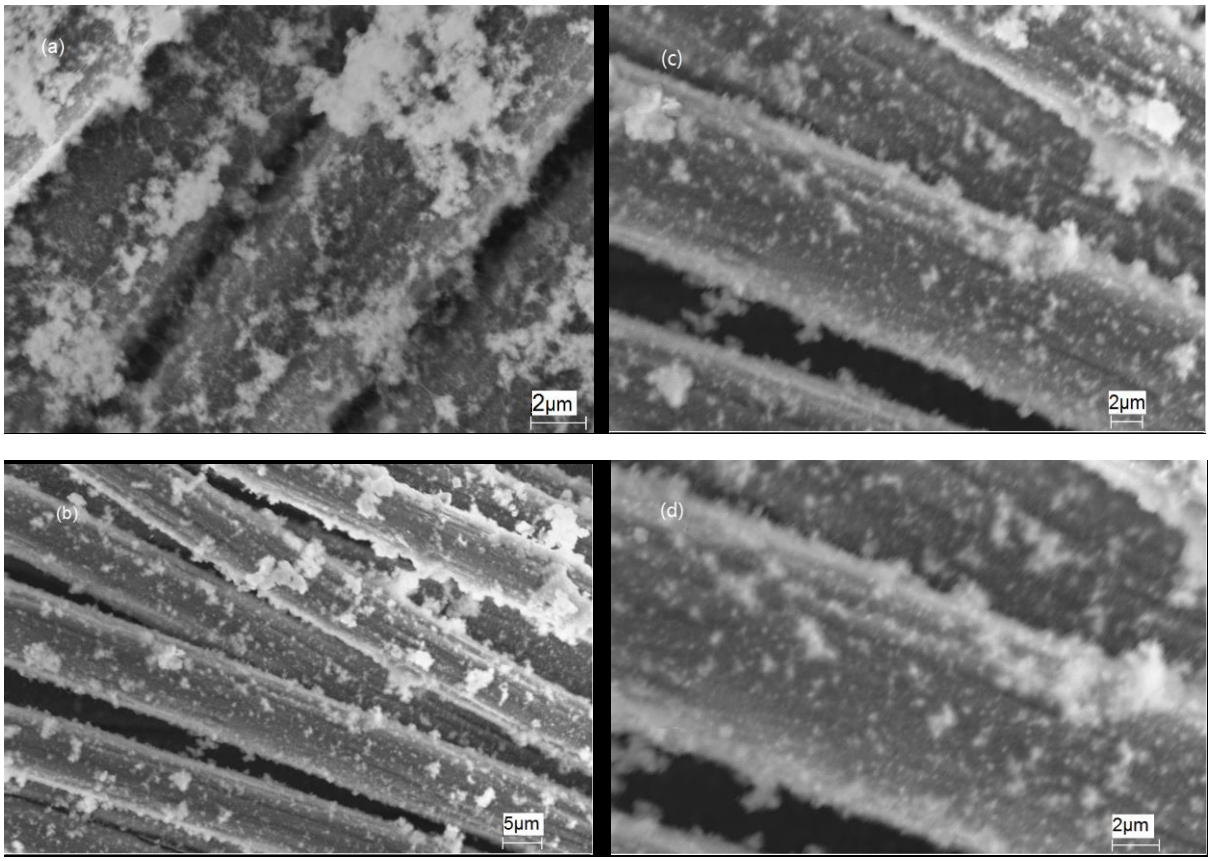

Figure S5. SEM images of (a) $Ni_{0.5}Fe_{0.5}$ DH; (b) $Ni_{0.6}Fe_{0.4}$ DH; (c) $Ni_{0.7}Fe_{0.3}$ DH; (d) $Ni_{0.8}Fe_{0.2}$ DH.

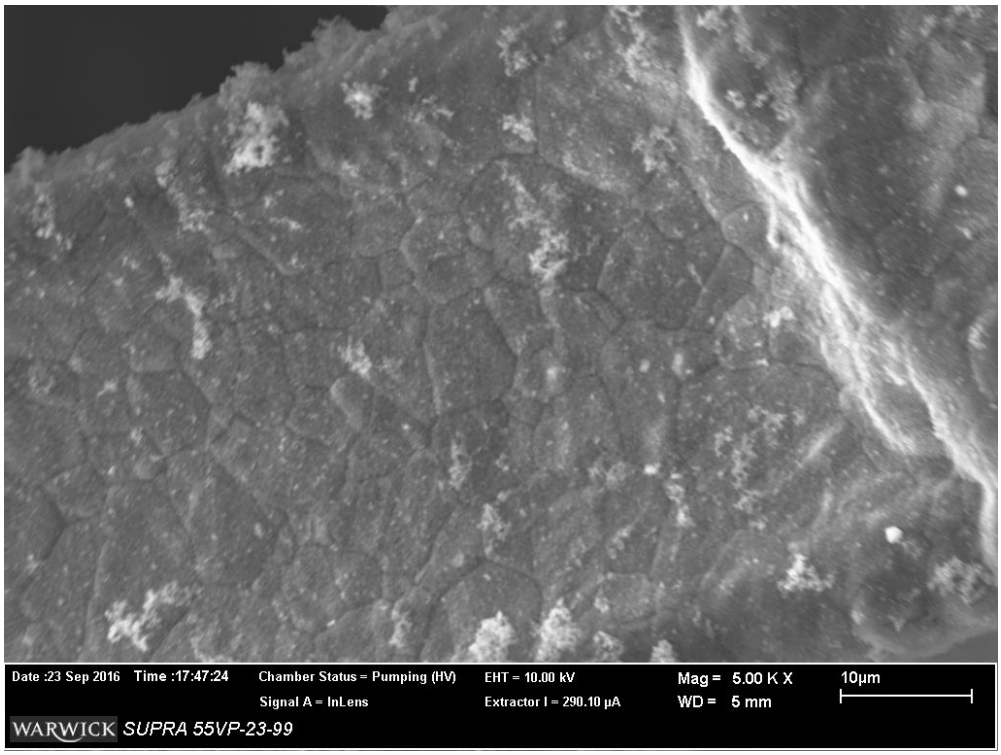

Figure S6. SEM images of Ni-Fe double hydroxides on NF (NiFe/NF).

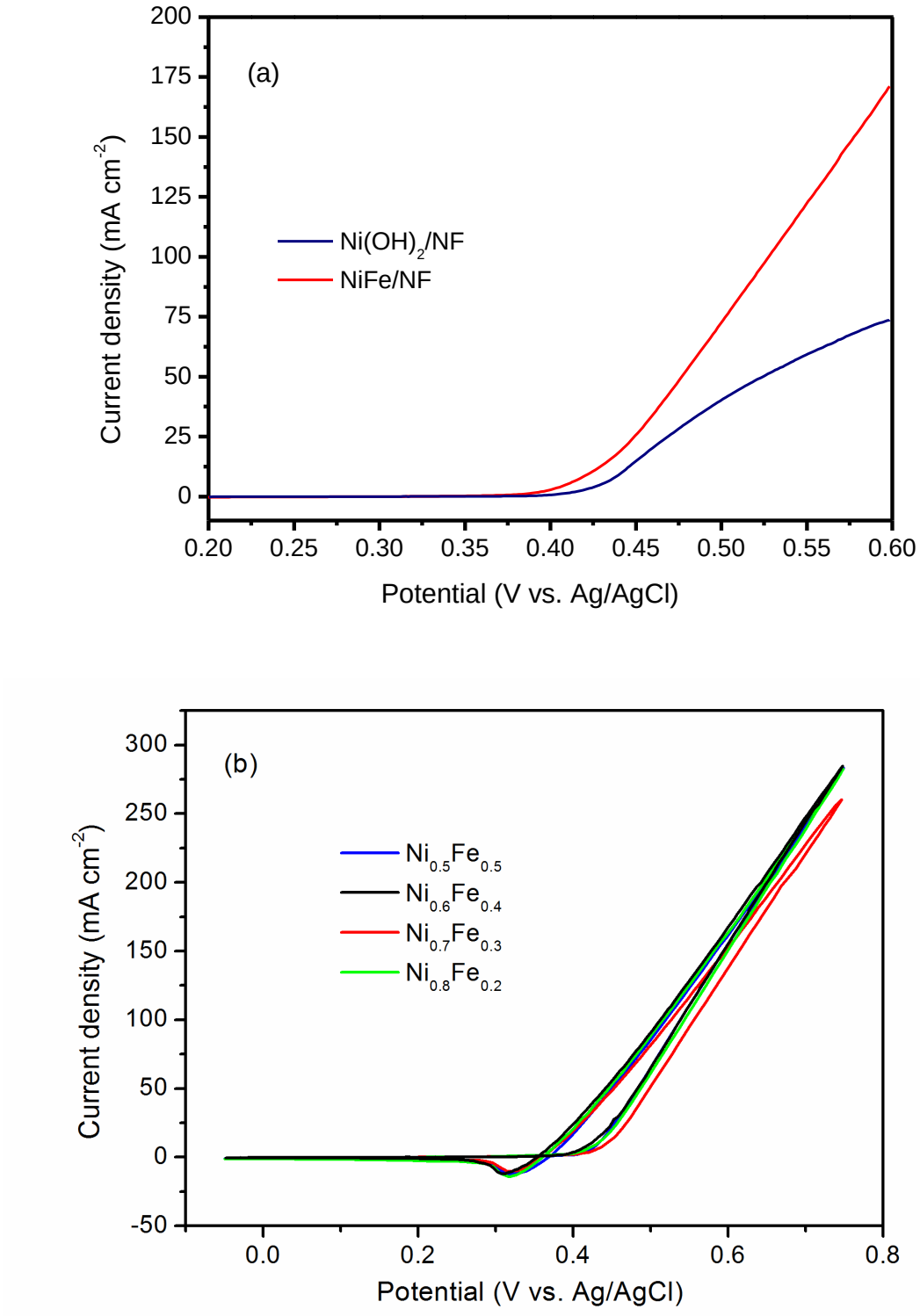

Figure S7. (a) LSVs of $Ni(OH)_2$/NF and NiFe/NF in 1 M NaOH with 0.33 M urea at scan rate of 2 mV s^{-1}; (b) CVs of NiFe hydroxides grown on NF using different atom ratios in precursor solution. Electrolyte: 1 M NaOH with 0.33 M urea. Scan rate: 25 mV s^{-1}

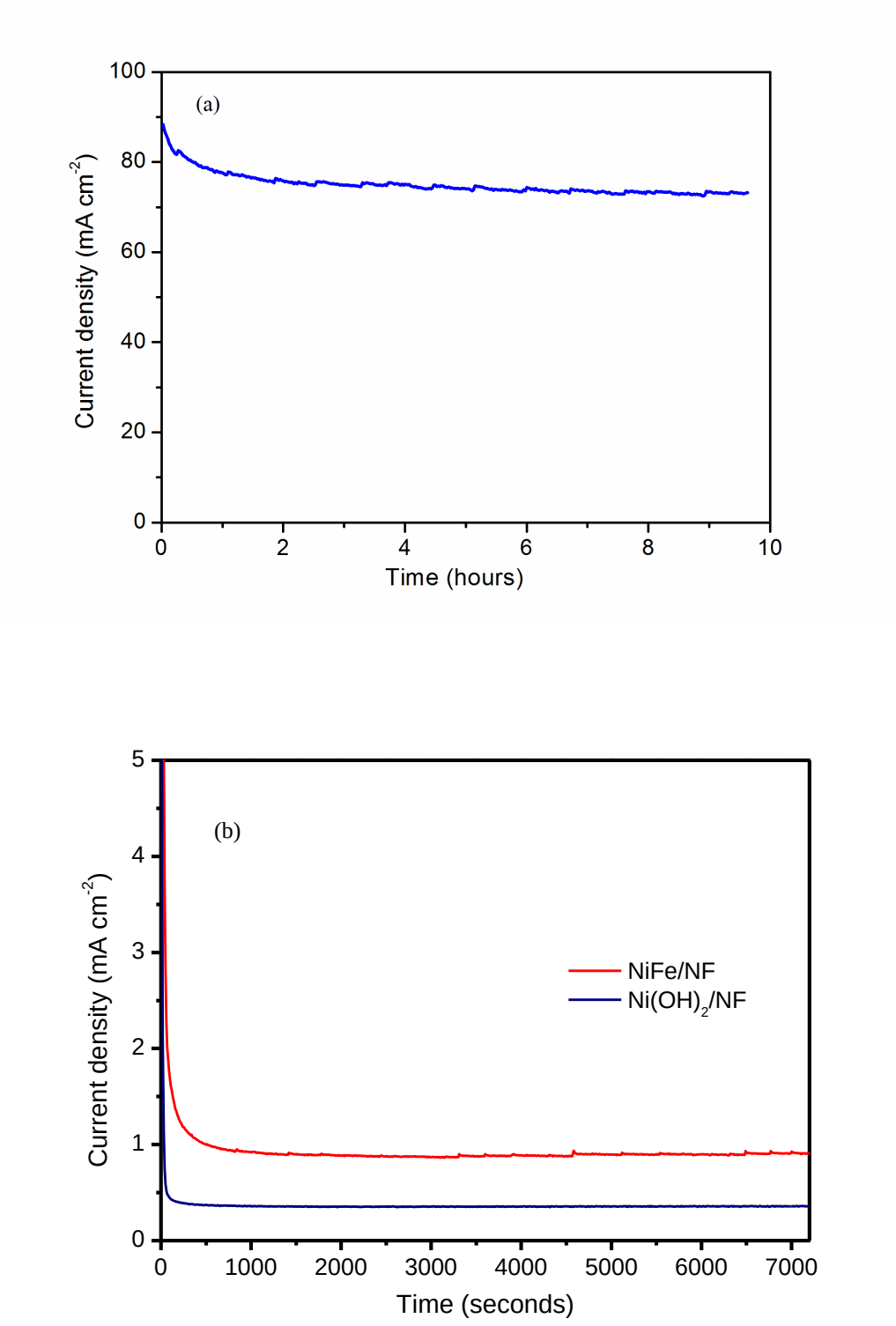

Figure S8. Chronoamperometric analysis at 0.5 V (vs. Ag/AgCl) of (a) NiFe/NF in 1.0 M NaOH+0.33 M urea; (b) $Ni(OH)_2$/NF and NiFe/NF in 1.0 M NaOH.

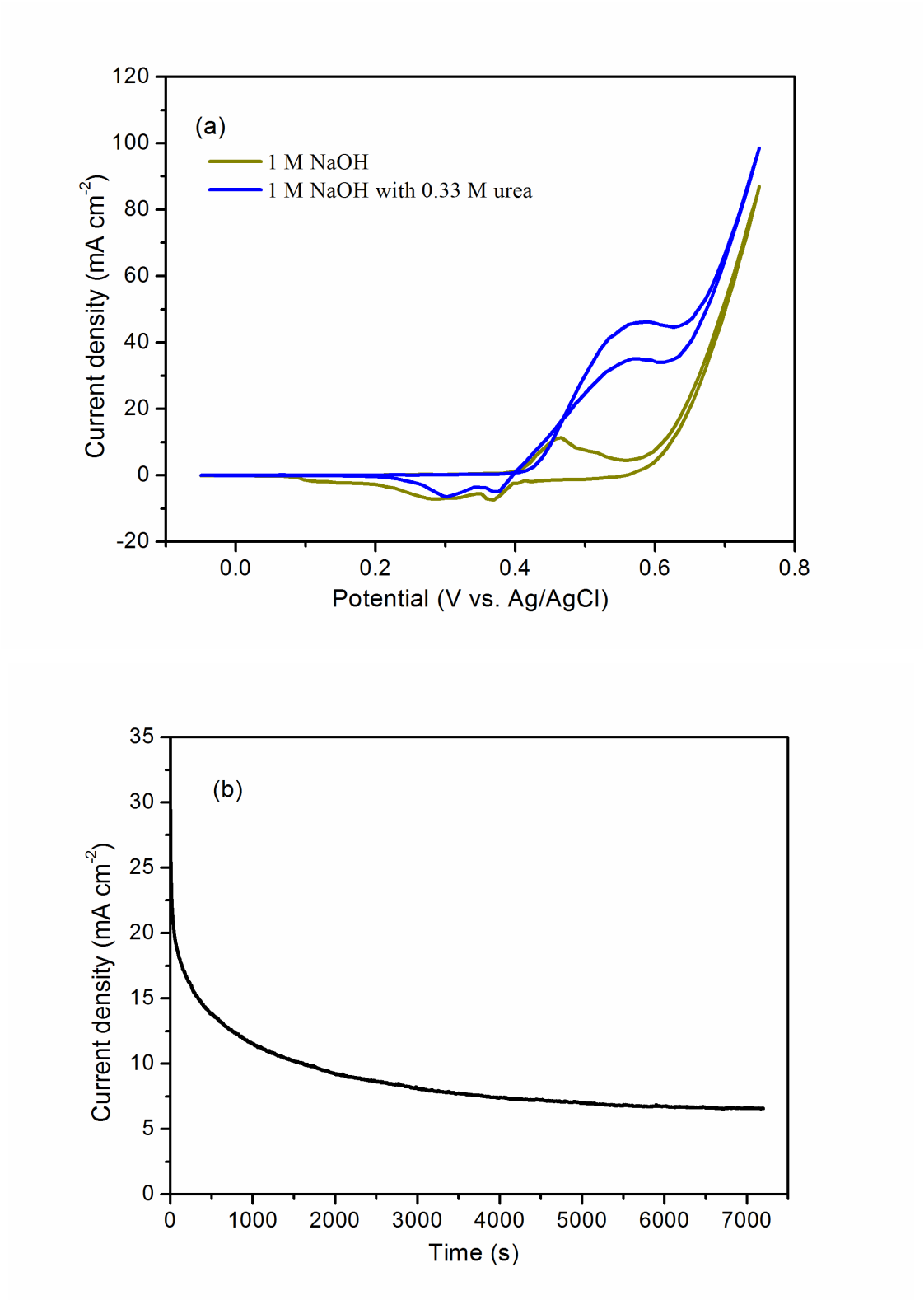

Figure S9. (a) CVs of bare Ni foam in 1 M NaOH with and without 0.33 M urea at scan rate of 25 mV s^{-1}; (b) Chronoamperometric analysis of bare Ni foam recorded at 0.5 V (vs. Ag/AgCl) in 1.0 M NaOH with 0.33 M urea.

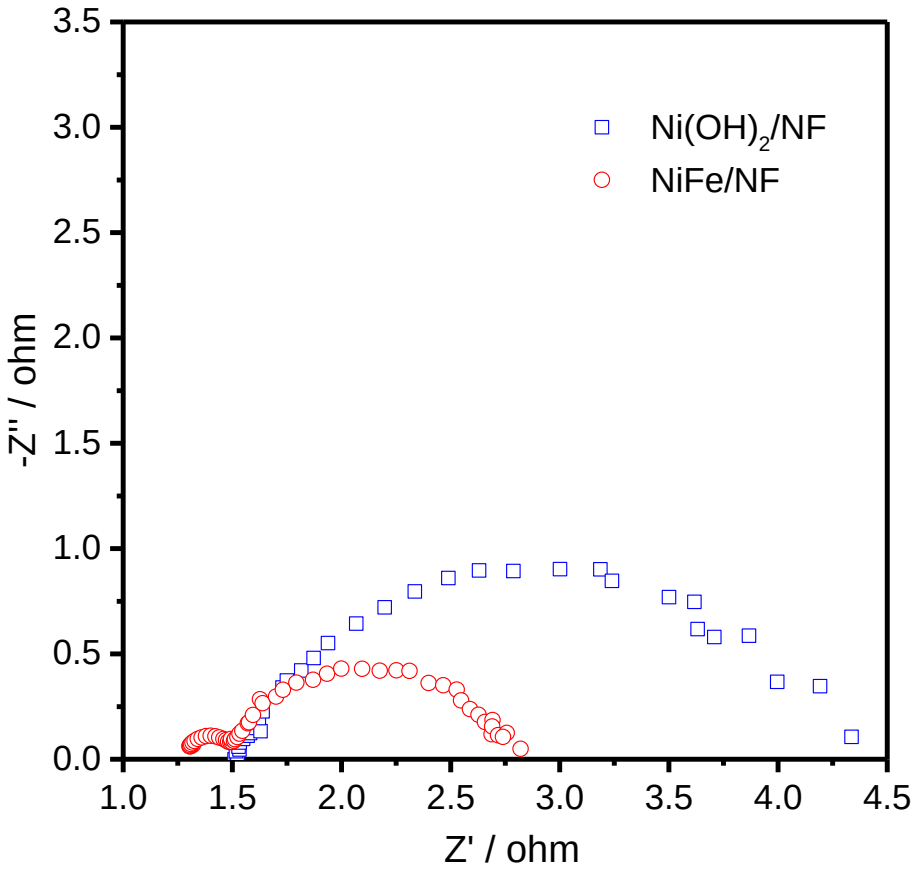

Figure S10. Nyquist plots of $Ni(OH)_2$/NF and NiFe/NF recorded at 0.5 V (vs. Ag/AgCl) in 1.0 M NaOH with 0.33 M urea.

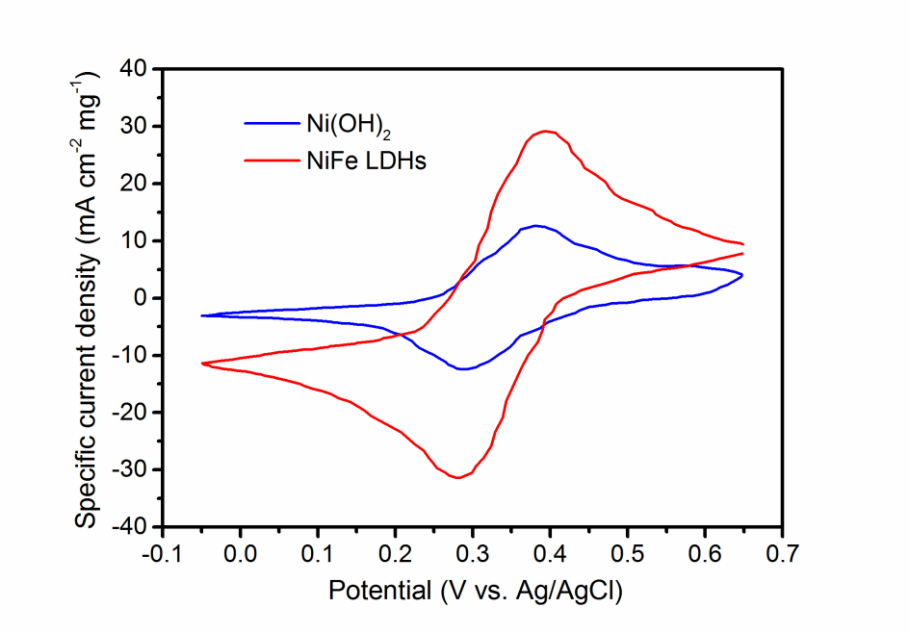

Figure S11. CV plots of NiFe DH and $Ni(OH)_2$ catalysts in 10 mM $K_3[Fe(CN)_6]$ with 1 M KCl at a scan rate of 50mV s^{-1}.

References

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