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Supporting Information

for

Facile one-step radio frequency magnetron sputtering of Ni/NiO on stainless steel for an efficient electrode for hydrogen evolution reaction

Ha Huu Do, Khac Binh Nguyen, Phuong N. Nguyen and Hoai Phuong Pham

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XRD and HER performance of Ni/SS; EDX spectra of various Ni/NiO/SS electrodes; CV curves in non-faradaic zone of electrodes at various scan rates (20–120 $mV \cdot s^{-1}$) in 1.0 M KOH

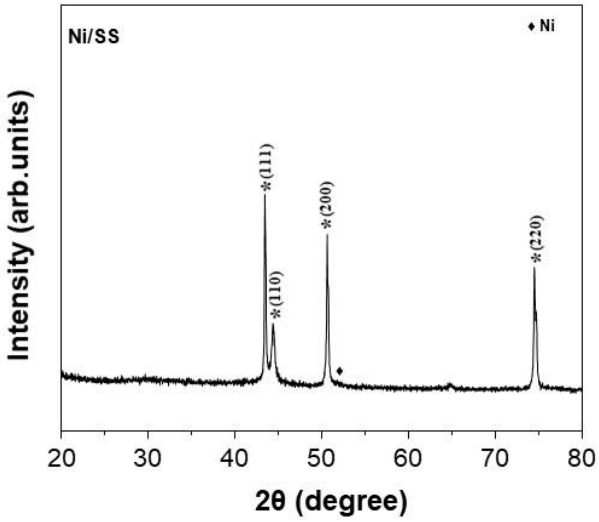

Figure S1: XRD data of Ni/SS.

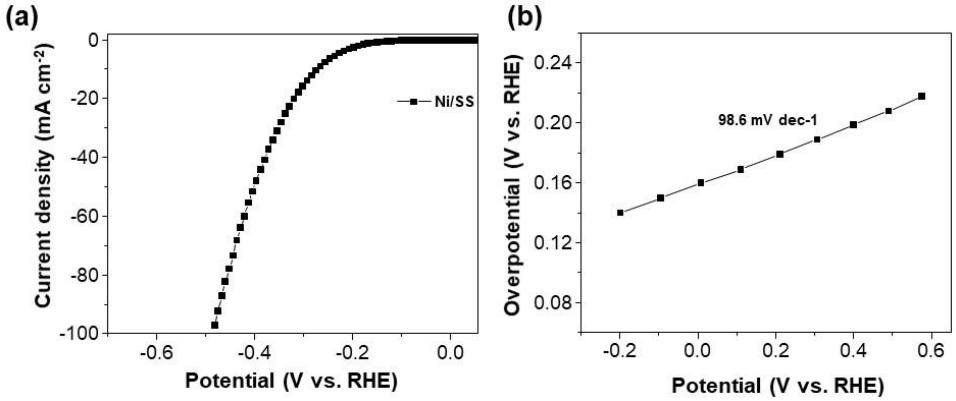

Figure S2: (a) Polarization curve of Ni/SS electrode, (b) corresponding Tafel slope of Ni/SS electrode.

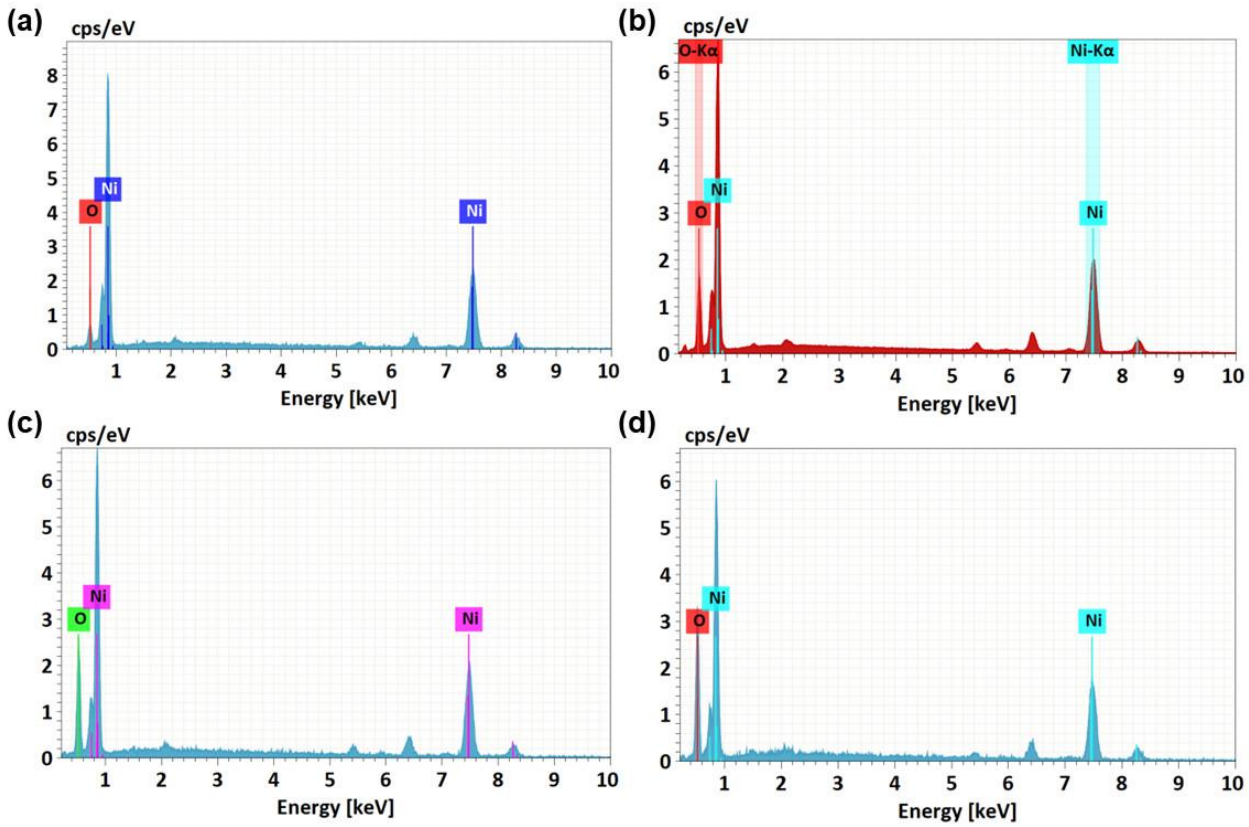

Figure S3: EDX spectra of (a) Ni/NiO/SS-5, (b) Ni/NiO/SS-10, (c) Ni/NiO/SS-15, (d) Ni/NiO/SS-20.

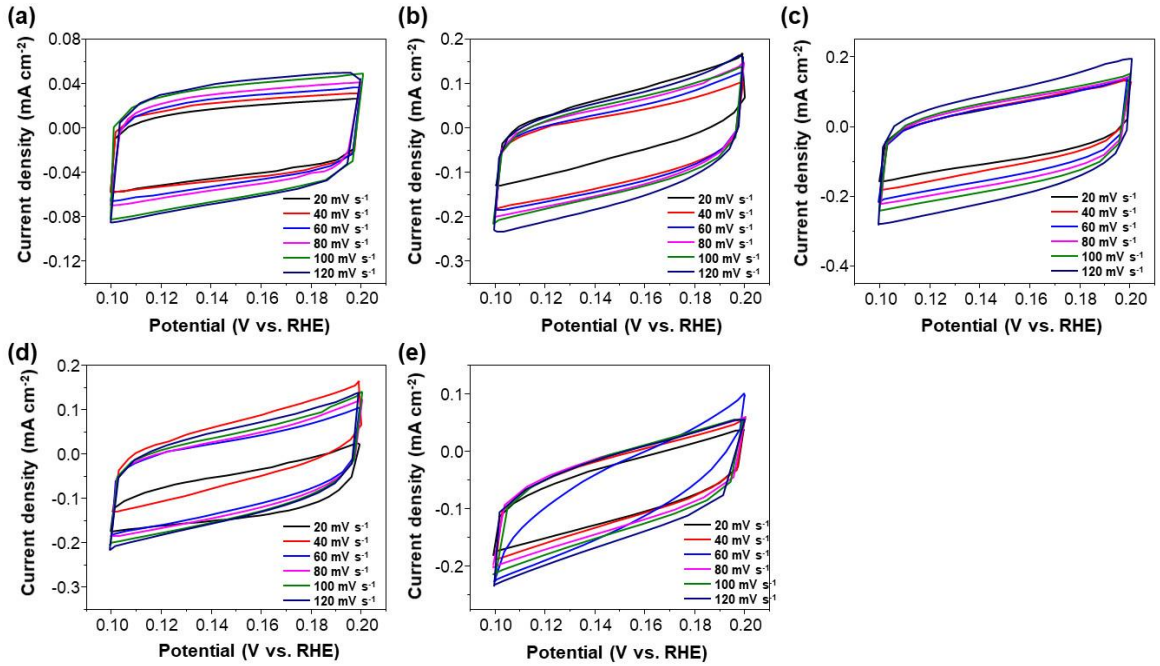

Figure S4: CV curves in non-faradaic zone of SS, Ni/NiO/SS-5, Ni/NiO/SS-10, Ni/NiO/SS-15, Ni/NiO/SS-20 at various scan rates (20–120 mV/s) in 1.0 M KOH.

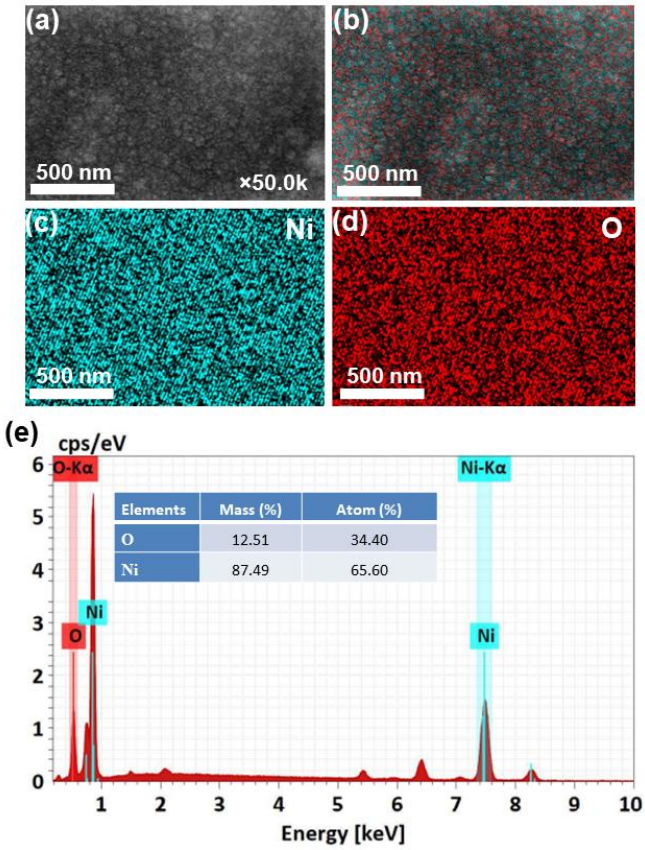

Figure S5: (a) SEM image, (b) Overall mapping elements corresponding to (c) nickel, (d) oxygen, (e) EDX analysis of Ni/NiO/SS-10 electrode after stability test.

Calculation of TOF

The number (N_{Ni}) of surface-active sites per cm^2 is calculated based on Eqs (S1) and (S2):

$$N_{Ni} = n_{Ni} \times N_A \quad \text{(S1)}$$

$$N_{Ni} = \frac{m(film)\, mg \times Wt.\%Ni}{58.693 \times 10^3 mg mol^{-1}} \times 6.022 \times 10^{23} \frac{1}{mol} \quad \text{(S2)}$$

Wt.% is the weight percent of Ni in the sample.

The number of total hydrogen is calculated from the current density using Eqs (S3)

$$\left(j \frac{mA}{cm^2}\right)\left(\frac{1\ A}{1000\ mA}\right)\left(\frac{1\ {}^{C}/_{s}}{1\ A}\right)\left(\frac{1\ mol\ e^-}{96485.3\ C}\right)\left(\frac{1\ mol\ H_2}{2\ mol\ e^-}\right) \times$$

$$\left(\frac{6.022 \times 10^{23} molecules\ H_2}{1\ mol\ H_2}\right) = 3.12 \times 10^{15} \frac{{}^{H_2}/_{s}}{cm^2} per \frac{mA}{cm^2} \quad \text{(S3)}$$

Here j: ($mA \cdot cm^{-2}$) is the current density at an overpotential of 200 mV in 1.0 M KOH; therefore, the TOF per site is calculated as Eqs (S4).

$$\frac{\left(3.12 \times 10^{15} \frac{{}^{H_2}/_{s}}{cm^2} per \frac{mA}{cm^2}\right)\left(j \frac{mA}{cm^2}\right)}{(N_{Ni})} = \left(3.12 \times 10^{15} \times \frac{j}{N_{Ni}}\right) \frac{{}^{H_2}/_{s}}{surface} \quad \text{(S4)}$$