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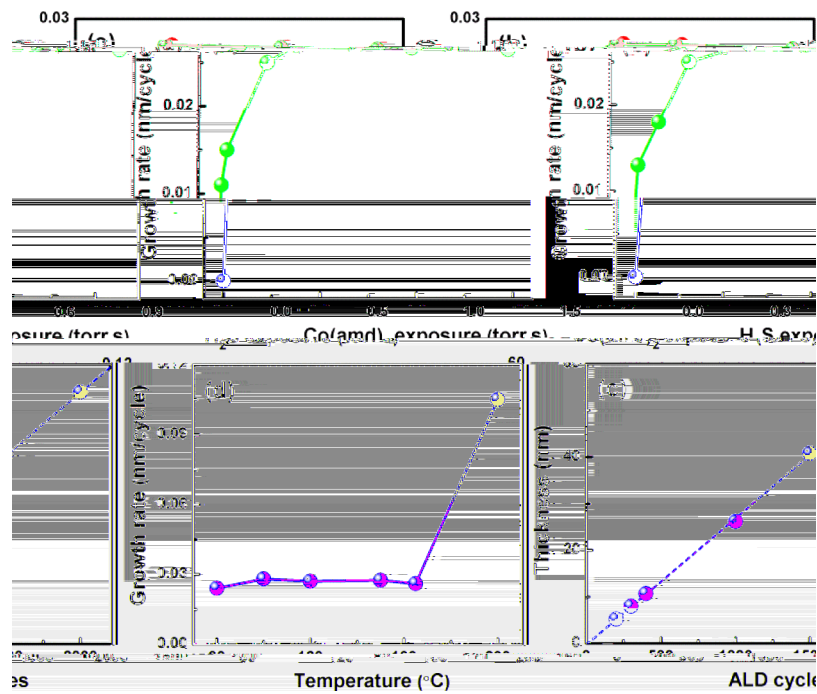


Figure 1.

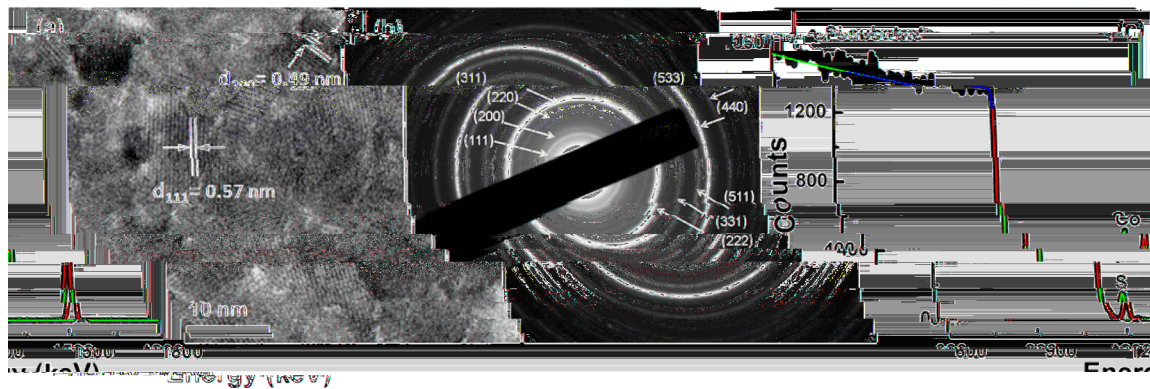


Figure 2.

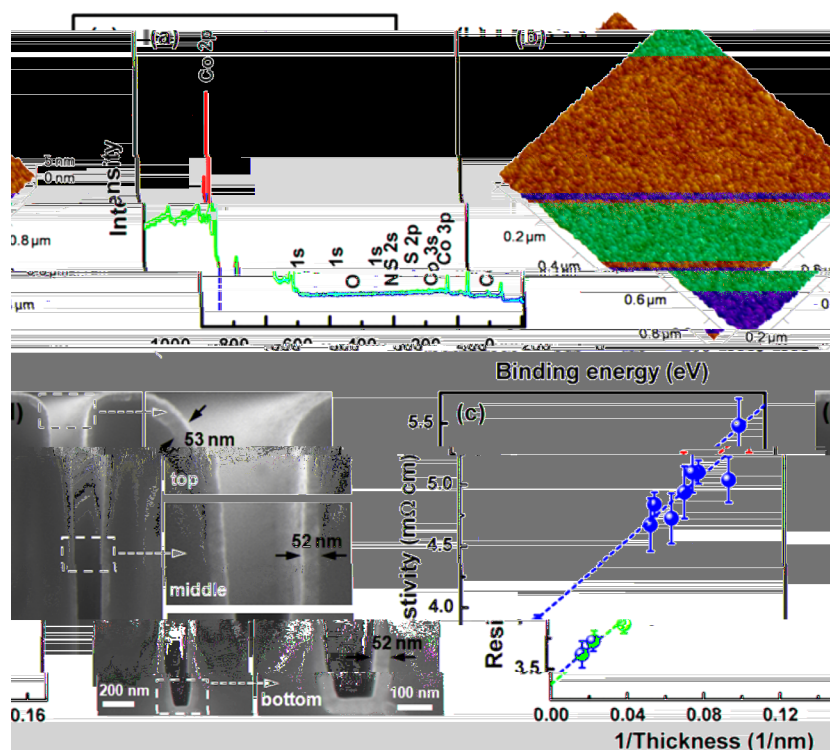


Figure 3. (a) XPS spectra showing intensity vs. binding energy (eV) for Co 2p, 1s, N 1s, S 2p, Co 3s, and Co 3p. (b) 3D AFM image of a device with dimensions 0.2 μm , 0.4 μm , 0.6 μm , and 0.8 μm . (c) SEM images of the top, middle, and bottom layers with thicknesses of 53 nm, 52 nm, and 52 nm, respectively. (d) Plot of resistivity (ρ) vs. $1/\text{Thickness}$ ($1/\text{nm}$) showing a linear increase from ~ 3.5 to ~ 5.5 m Ω cm. (e) Plot of residual resistance (Resi) vs. $1/\text{Thickness}$ ($1/\text{nm}$) showing a linear increase from ~ 3.5 to ~ 5.5 .

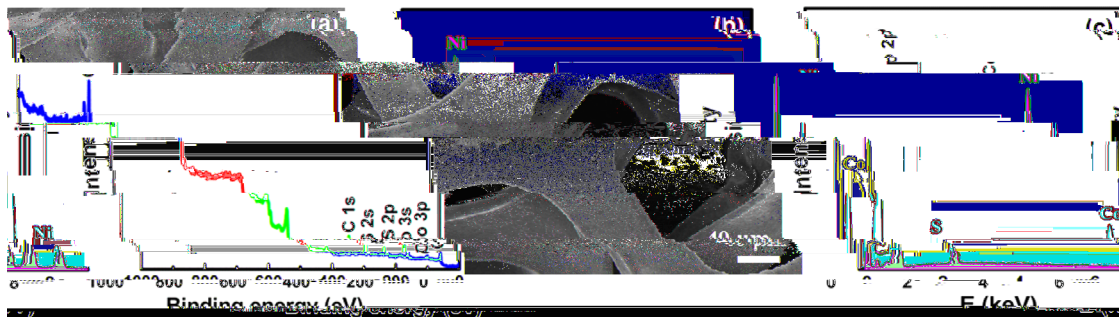


Figure 4. (a) SEM image of the electrode surface. (b) XPS spectra of C 1s, S 2s, S 2p, O 3s, and O 3p. (c) EDS elemental mapping showing the distribution of elements.

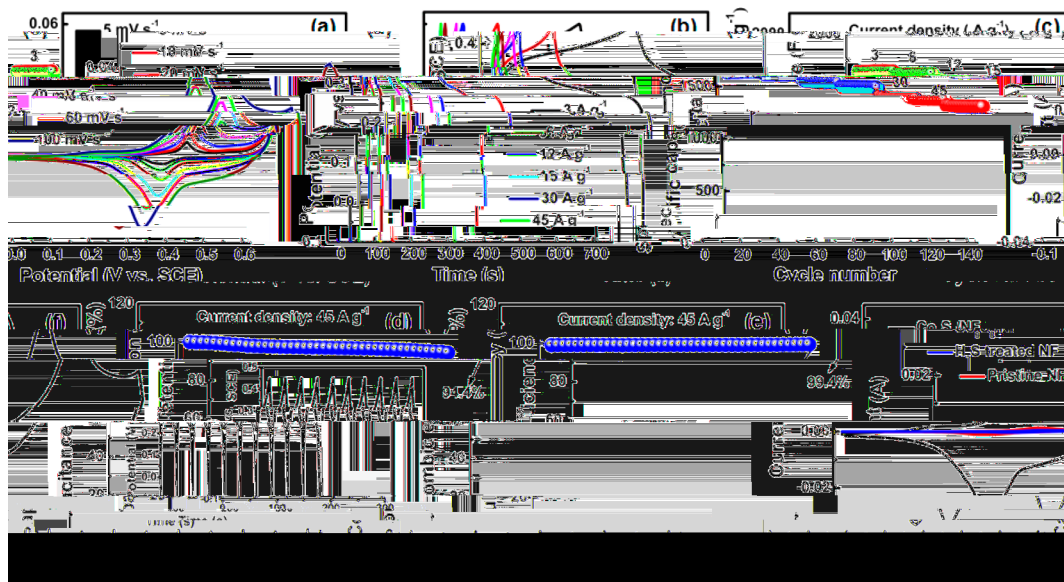
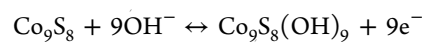


Figure 5. (a) CV curves at various scan rates. (b) GCD curves at various current densities. (c) Nyquist plot. (d) EIS spectra. (e) Chronoamperometric response. (f) Chronopotentiometric response. (g) Cyclic voltammetry at 45 Ag⁻¹. (h) Cyclic voltammetry at 45 Ag⁻¹. (i) Cyclic voltammetry at 45 Ag⁻¹. (j) Cyclic voltammetry at 45 Ag⁻¹.

The electrochemical performance of the electrode was evaluated by cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS). The CV curves (Figure 5a) show a typical redox behavior with two main peaks at approximately 0.3 V and 0.5 V. The GCD curves (Figure 5b) show a typical rectangular shape, indicating good capacitive behavior. The Nyquist plot (Figure 5c) shows a single semicircle, indicating a single rate-determining step. The EIS spectra (Figure 5d) show a typical capacitive behavior with a phase angle of approximately -90°. The chronoamperometric response (Figure 5e) shows a typical capacitive behavior with a current density of approximately 45 Ag⁻¹. The chronopotentiometric response (Figure 5f) shows a typical capacitive behavior with a potential of approximately 0.3 V. The cyclic voltammetry at 45 Ag⁻¹ (Figure 5g-h) shows a typical redox behavior with two main peaks at approximately 0.3 V and 0.5 V. The cyclic voltammetry at 45 Ag⁻¹ (Figure 5i-j) shows a typical redox behavior with two main peaks at approximately 0.3 V and 0.5 V.

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Preparation of $\text{Co}_9\text{S}_8/\text{NF}$ Electrodes.

Electrochemical Characterizations.

■ ASSOCIATED CONTENT

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