Zn modified Co@N-C composites with adjusted Co particle sizes as catalysts for efficient electroreduction of CO_2

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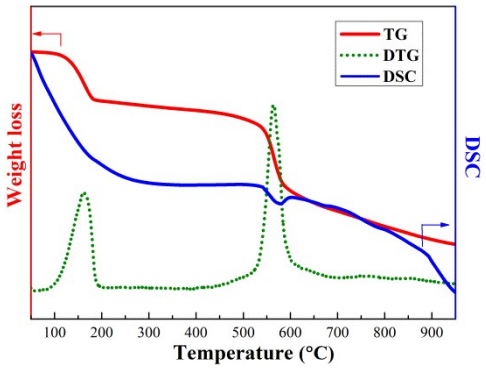

Figure S1. TG-DSC characterizations of the as-prepared Zn-Co-ZIF.

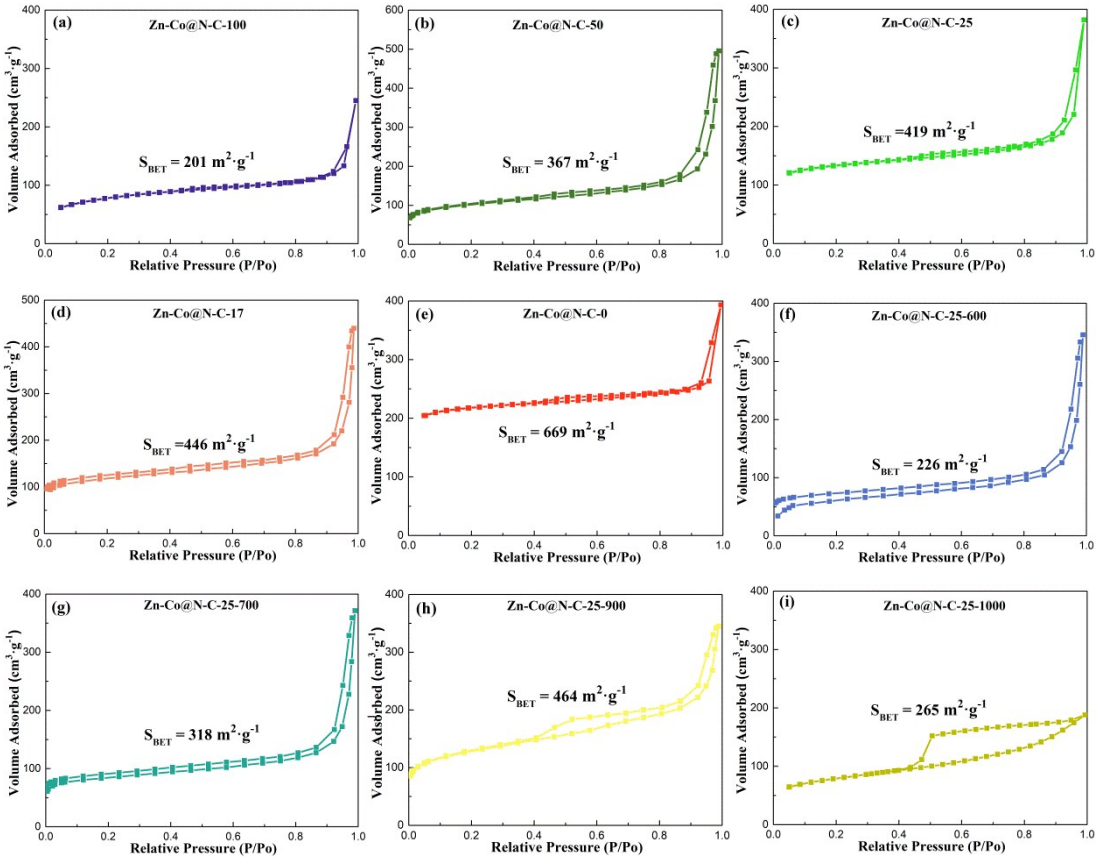

Figure S2. N_2 adsorption-desorption isotherms of Zn-Co@N-C-X with different Co contents and Zn-Co@N-C-25-Y with different pyrolysis temperatures.

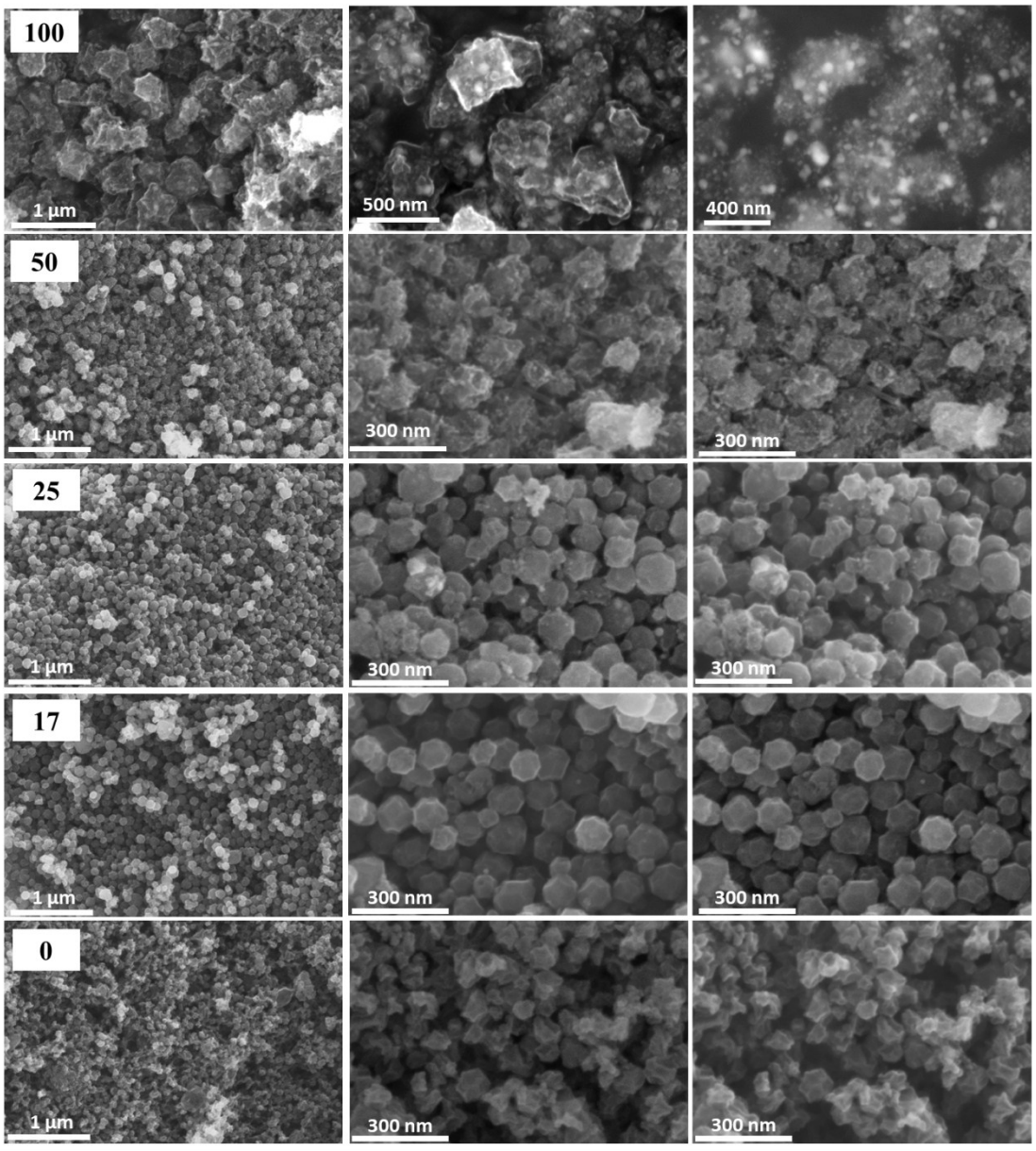

Figure S3. SEM image of Zn-Co@N-C-X with different Co contents.

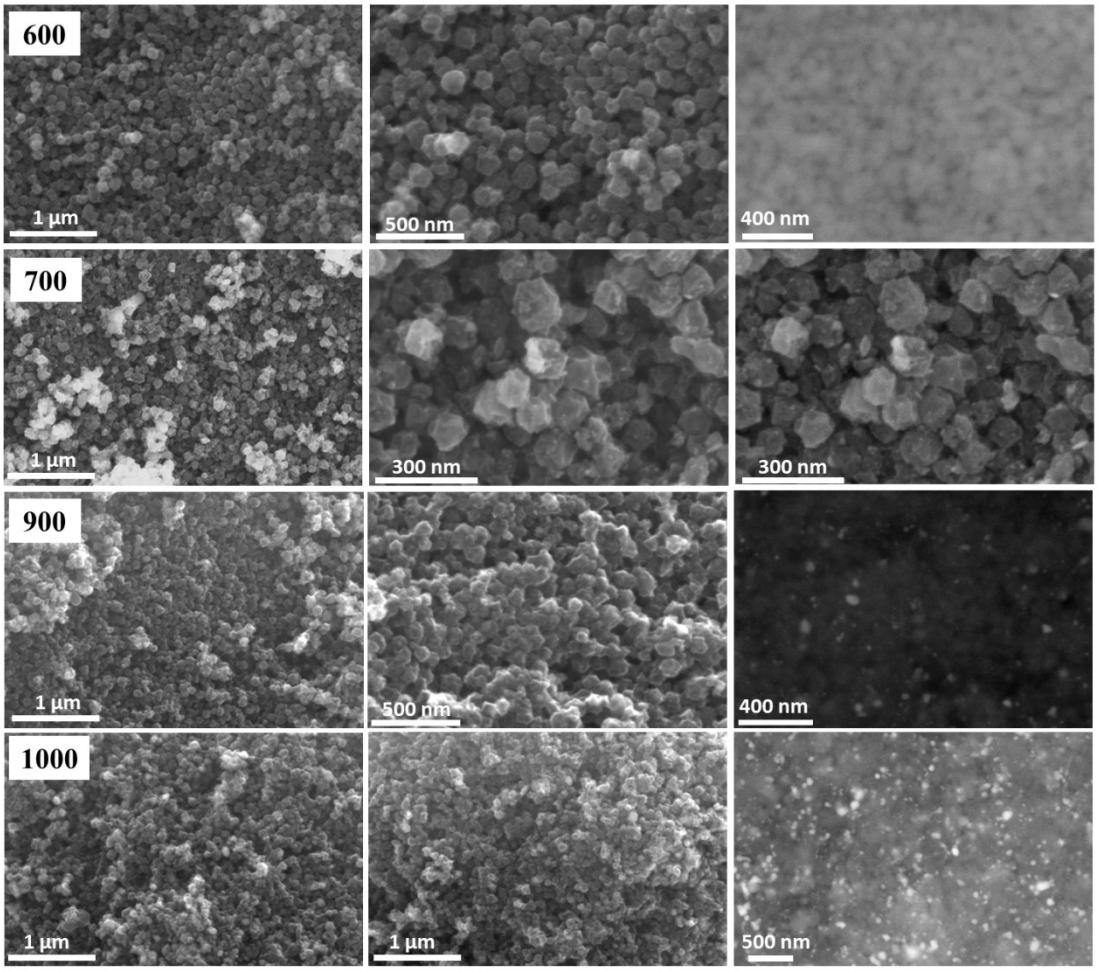

Figure S4. SEM image of Zn-Co@N-C-25-Y with different pyrolysis temperatures.

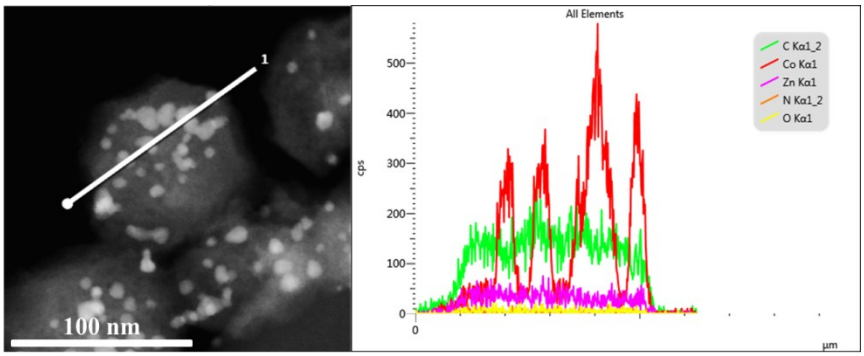

Figure S5. STEM and line-scanning EDS spectra of Zn-Co@N-C-25.

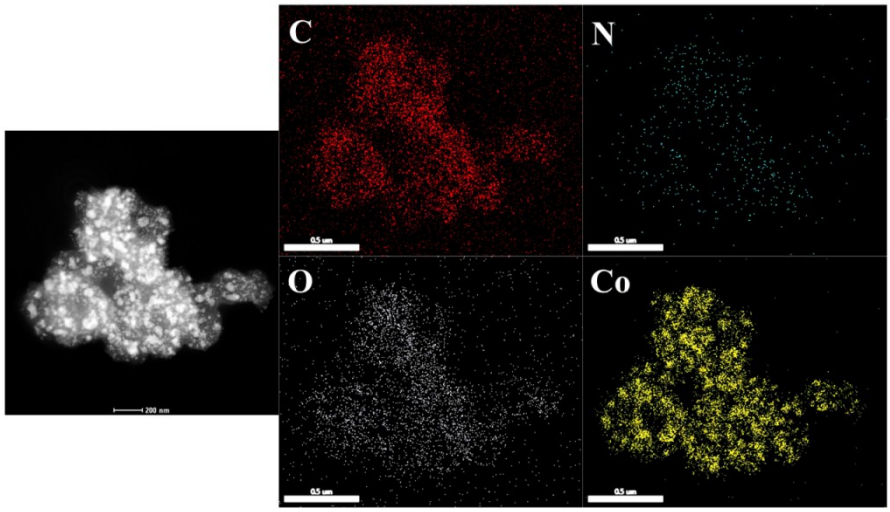

Figure S6. Elemental mapping of Zn-Co@N-C-100.

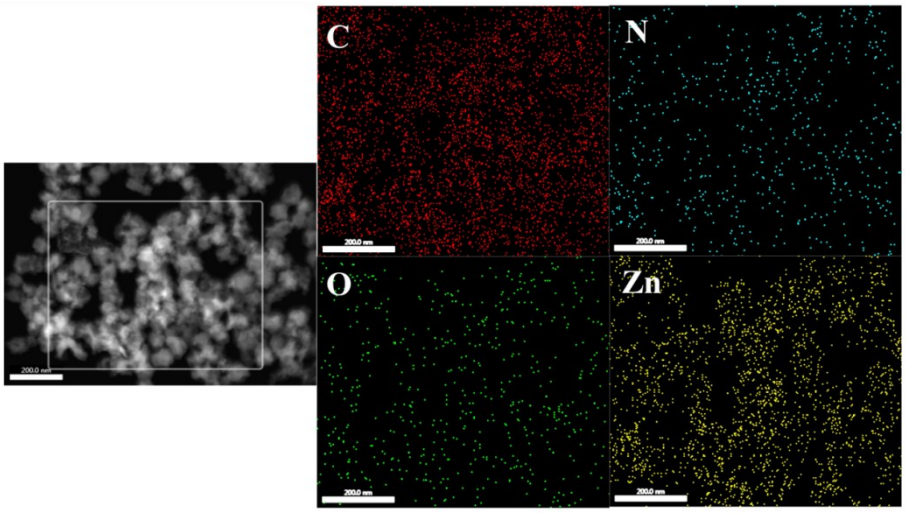

Figure S7. Elemental mapping of Zn-Co@N-C-0.

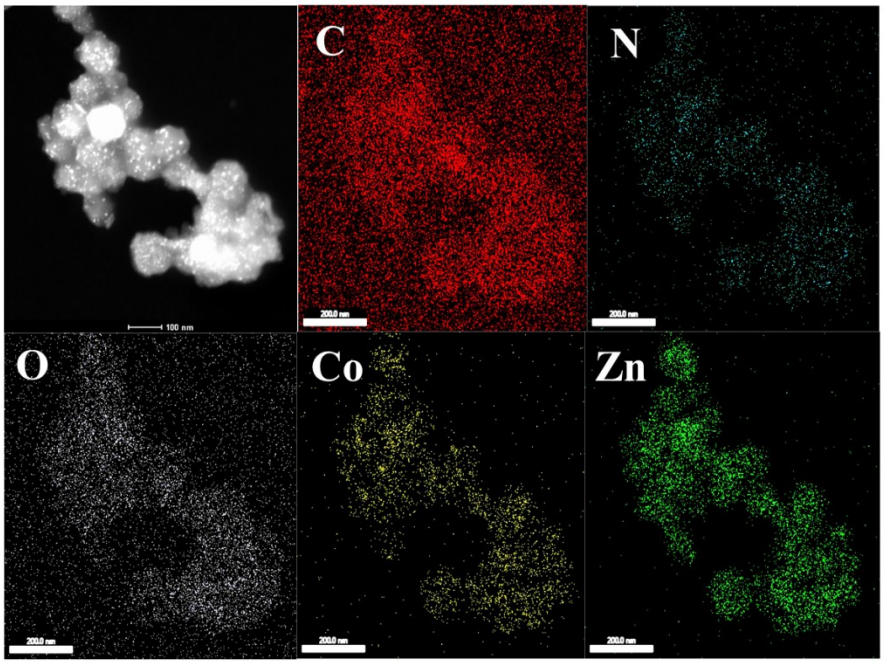

Figure S8. Elemental mapping of Zn-Co@N-C-25-600.

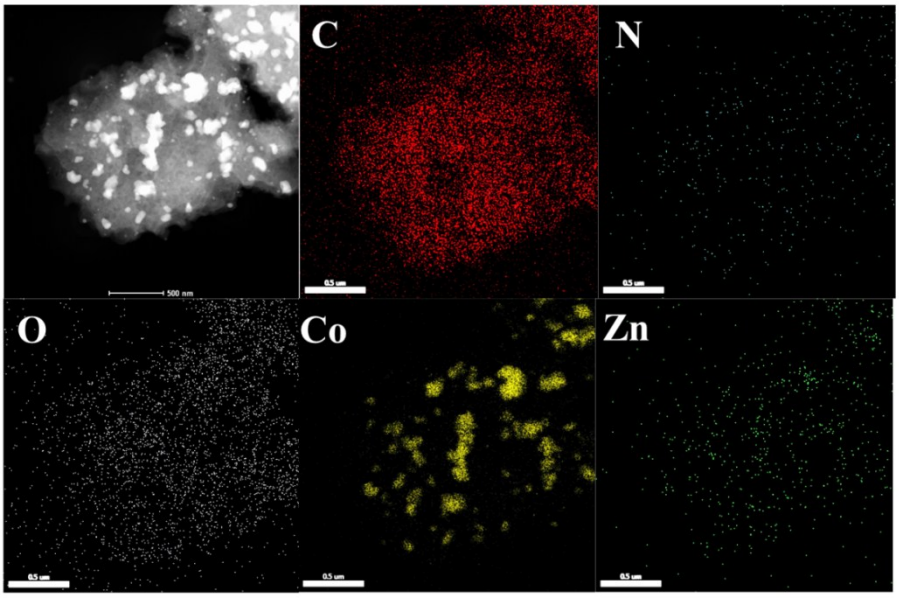

Figure S9. Elemental mapping of Zn-Co@N-C-25-1000.

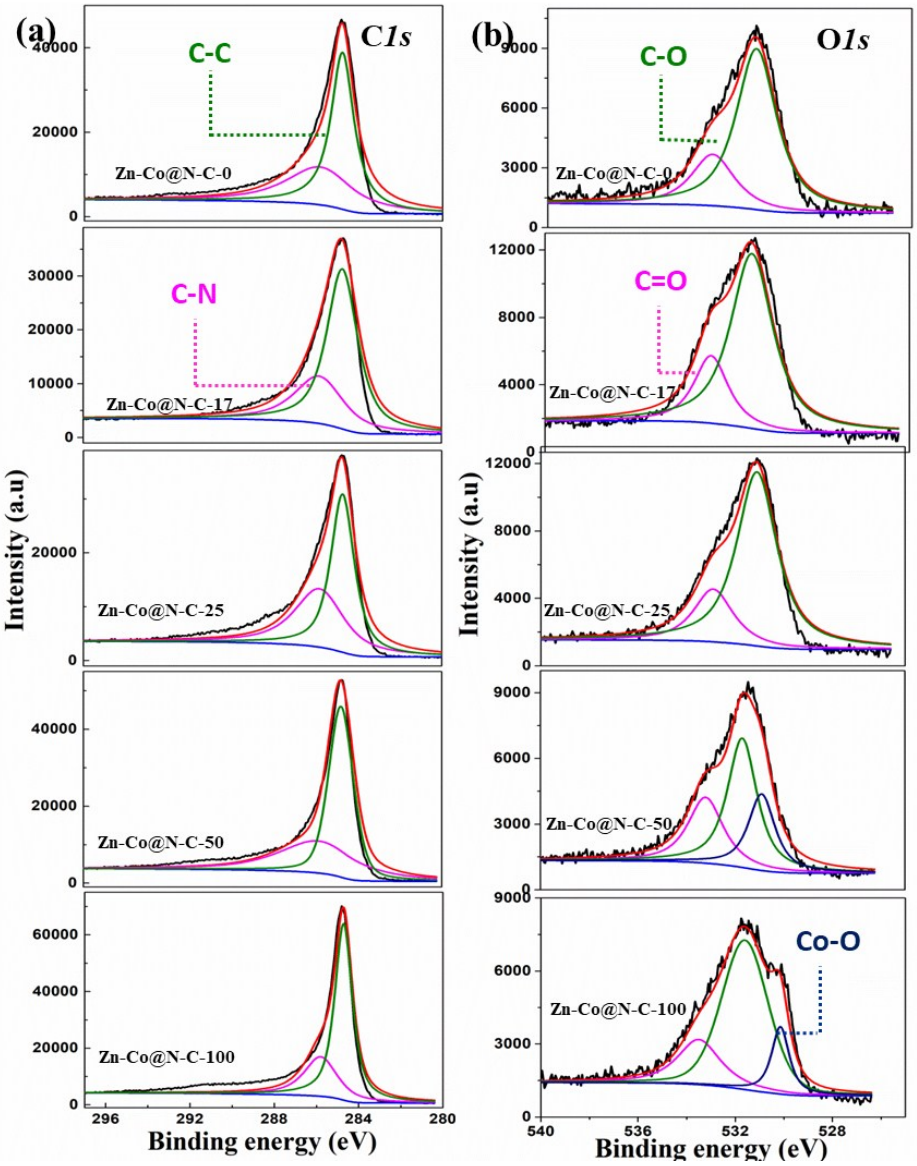

Figure S10. XPS spectra of Zn-Co@N-C-X with different Co contents: **(a)** C 1s and **(b)** O1s.

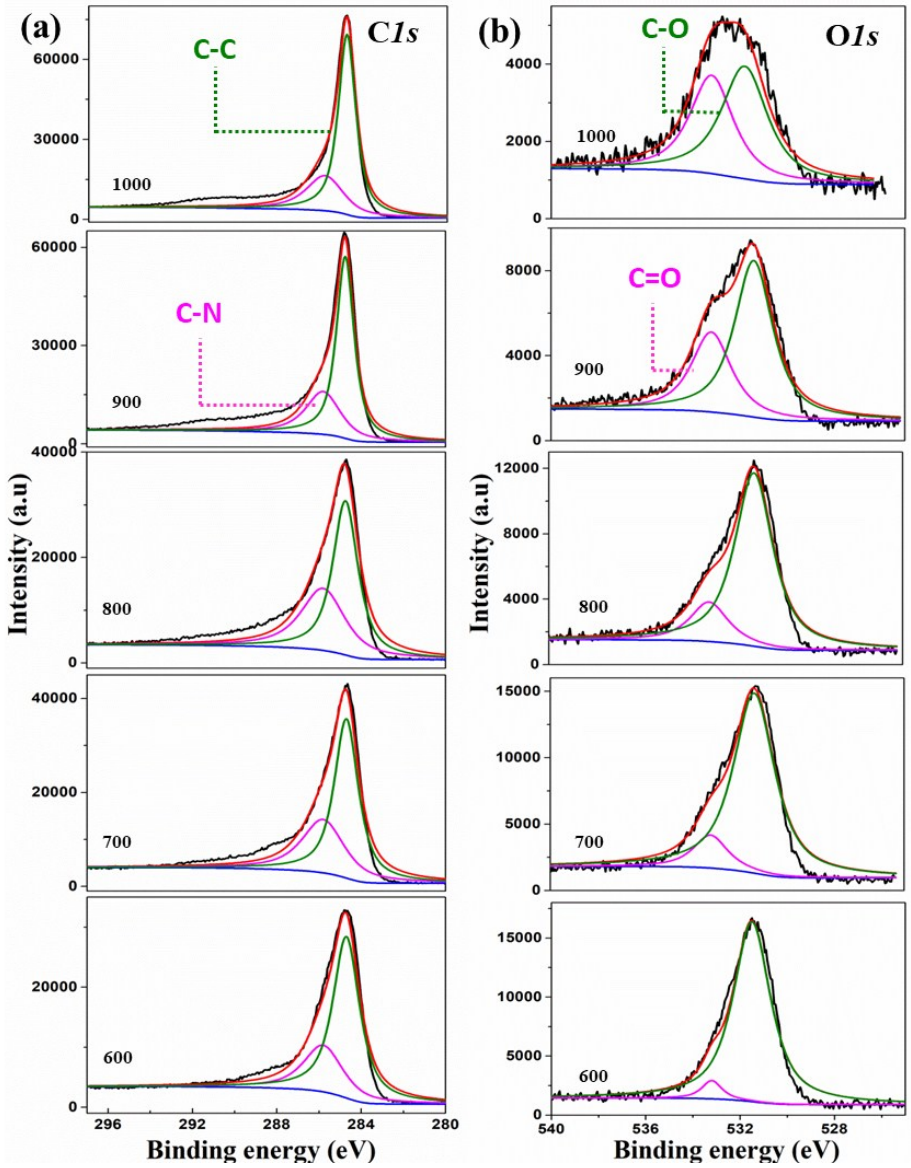

Figure S11. XPS spectra of Zn-Co@N-C-25-Y with different pyrolysis temperatures:

(a) C 1s and **(b)** O1s.

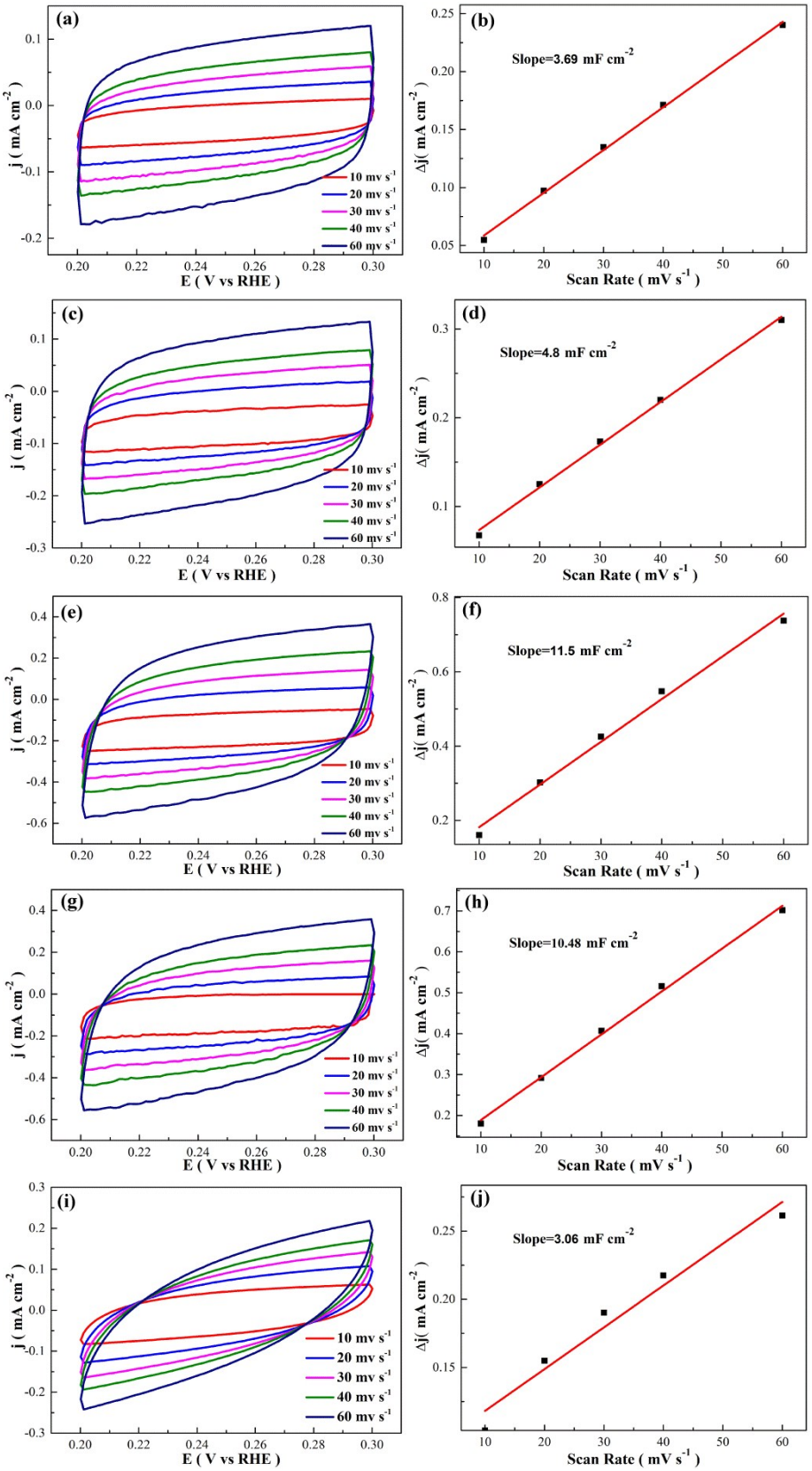

Figure S12. Cyclic voltammetry and charging current density differences plotted against scan rates: **(a, b)** Zn-Co@N-C-100, **(c, d)** Zn-Co@N-C-50, **(e, f)** Zn-Co@N-C-25, **(g, h)** Zn-Co@N-C-17 and **(i, j)** Zn-Co@N-C-0.

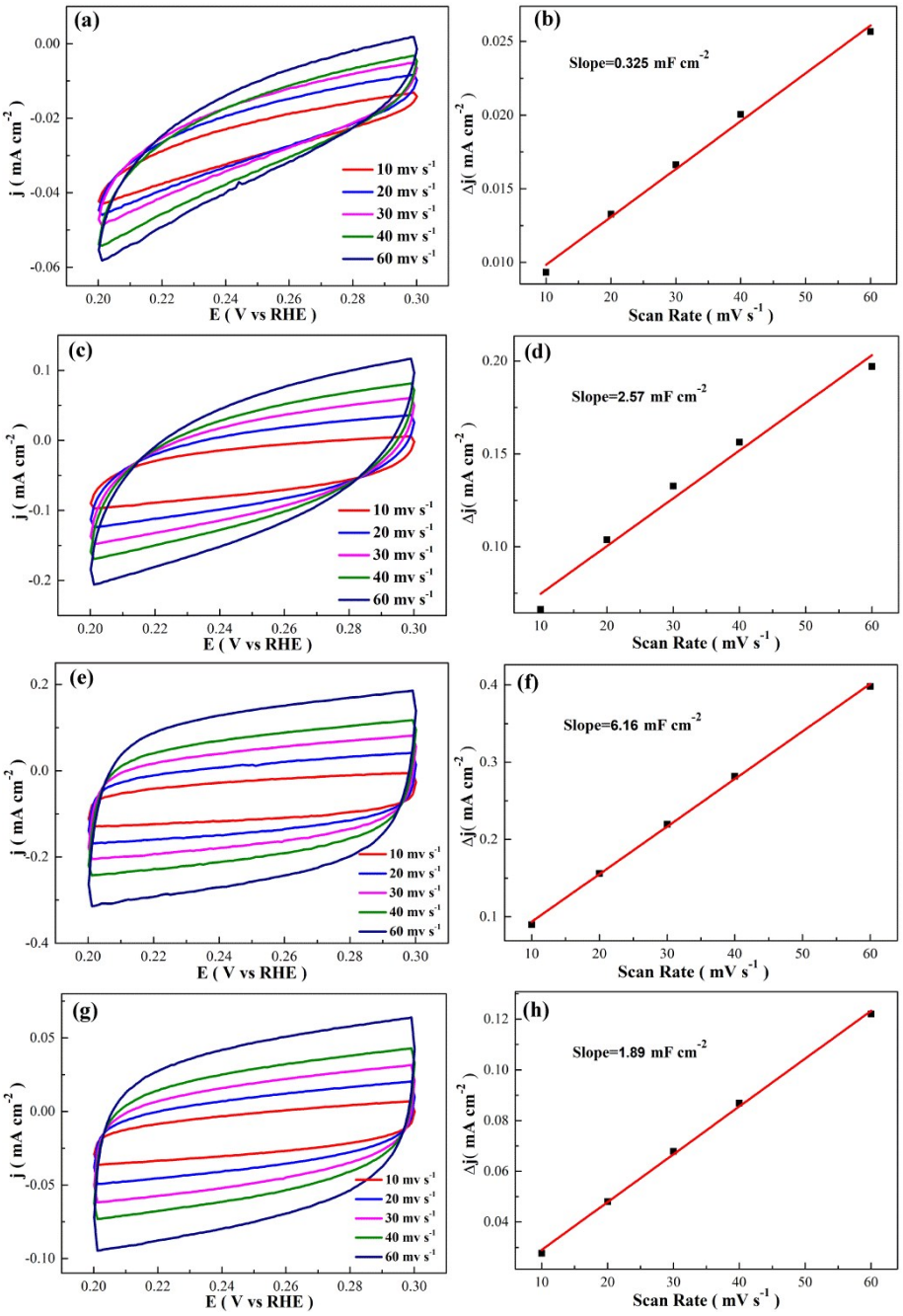

Figure S13. Cyclic voltammetry and charging current density differences plotted against scan rates: **(a, b)** Zn-Co@N-C-25-600, **(c, d)** Zn-Co@N-C-25-700, **(e, f)** Zn-Co@N-C-25-900 and **(g, h)** Zn-Co@N-C-25-1000.

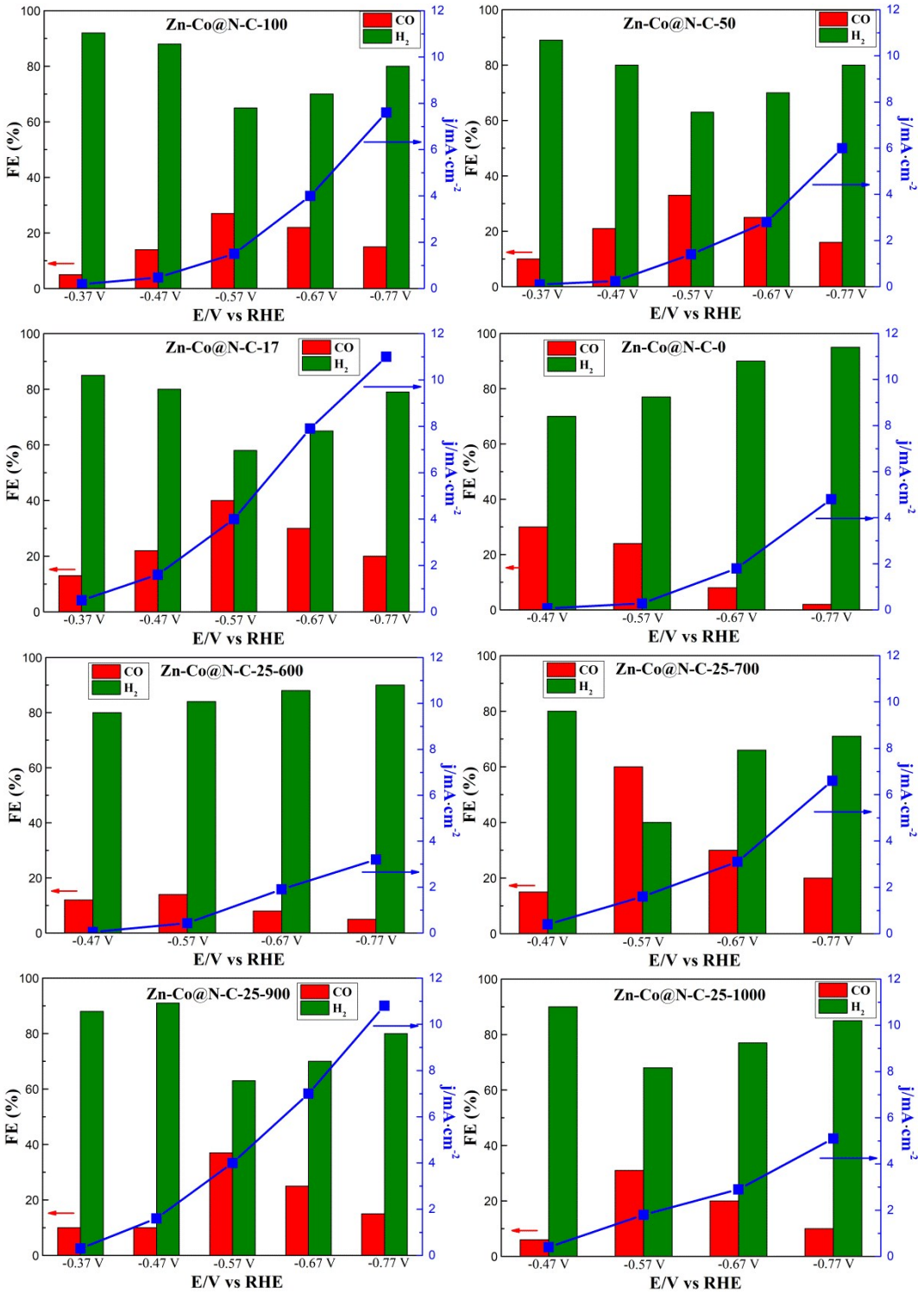

Figure S14. Catalytic performance of Zn-Co@N-C tested under different potentials.

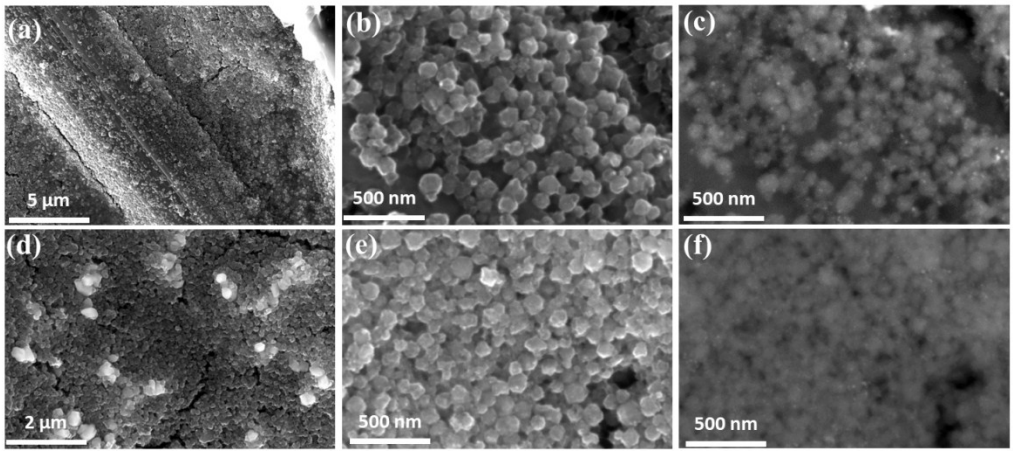

Figure S15. SEM images of Zn-Co@N-C-25/CP before **(a-c)** and after reaction **(d-f)**.

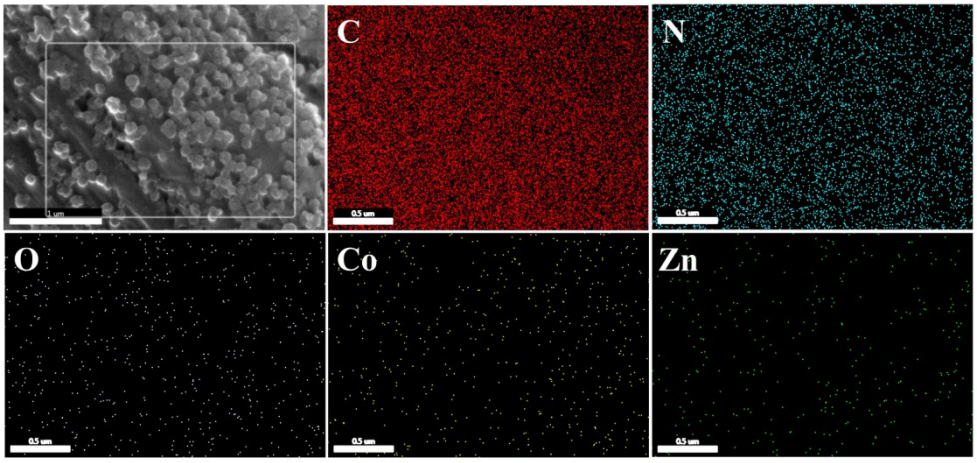

Figure S16. Elemental mapping of Zn-Co@N-C-25/CP before reaction.

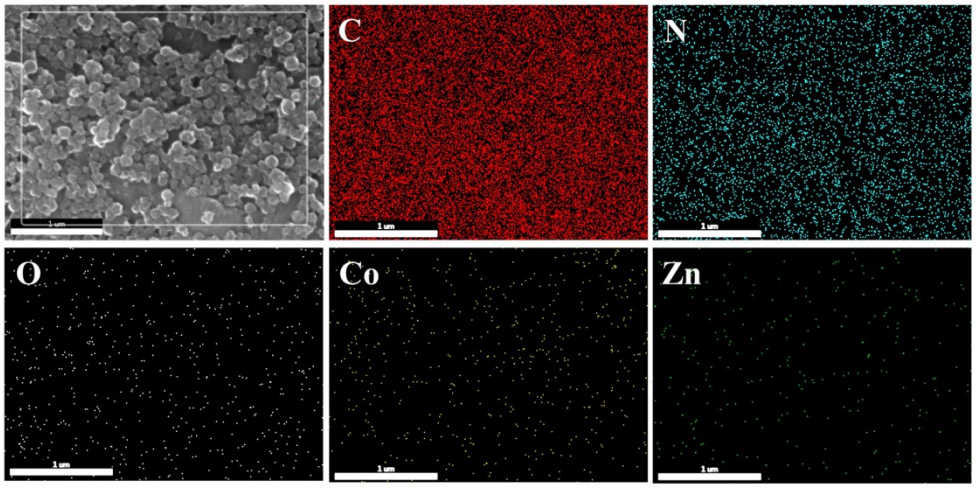

Figure S17. Elemental mapping of Zn-Co@N-C-25/CP after reaction.

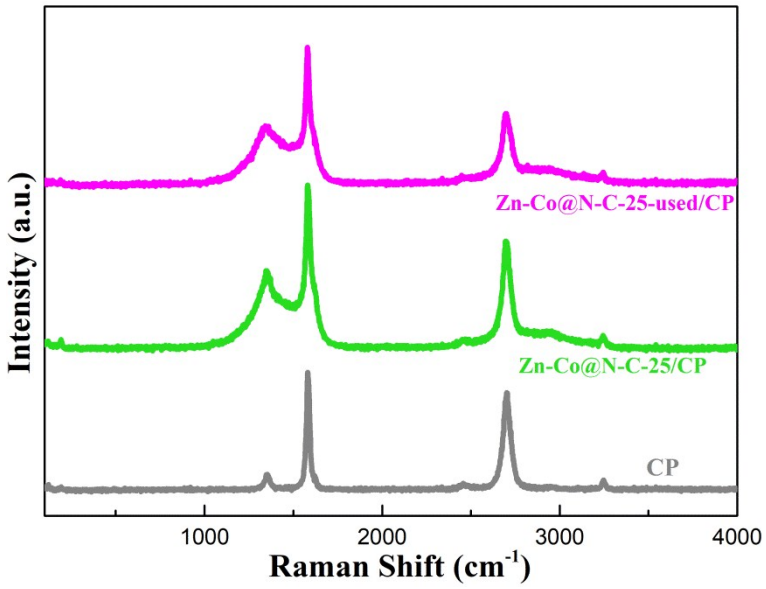

Figure S18. Raman spectra of carbon paper and Zn-Co@N-C-25/CP before and after reaction.