# Supporting Information

## Janus CoN/Co Cocatalyst in Porous N-doped Carbon: toward Enhance Catalytic Activity of Hydrogen Evolution

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### Supplementary Figures

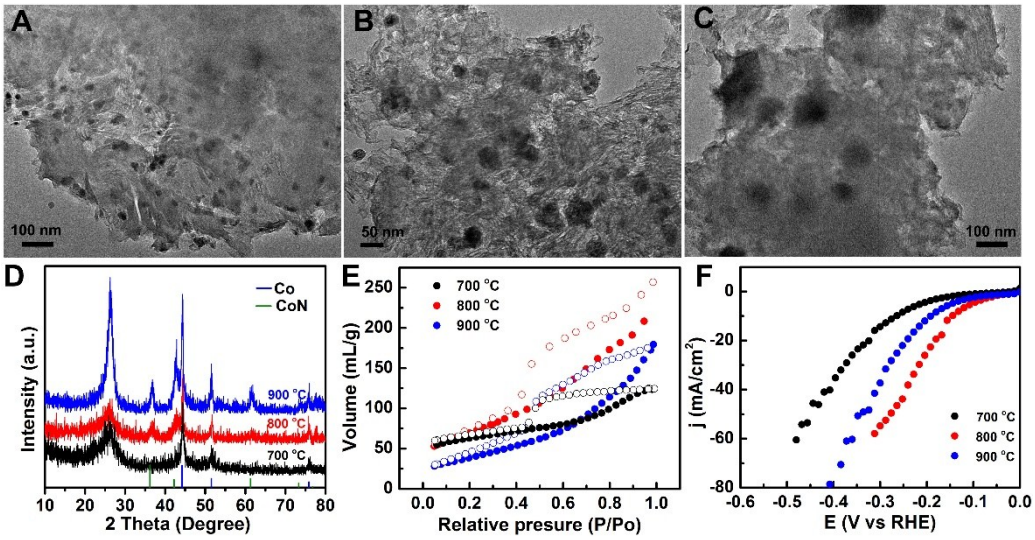


**Figure S1** TEM images for Co containing polymer calcinated at 700 °C (A), 800 °C (B), 900 °C (C). Comparative XRD patterns (D), $N_2$ adsorption-desorption isotherms and LSV curves (F) for Co containing polymer calcinated at 700 °C 800 °C and 900 °C.

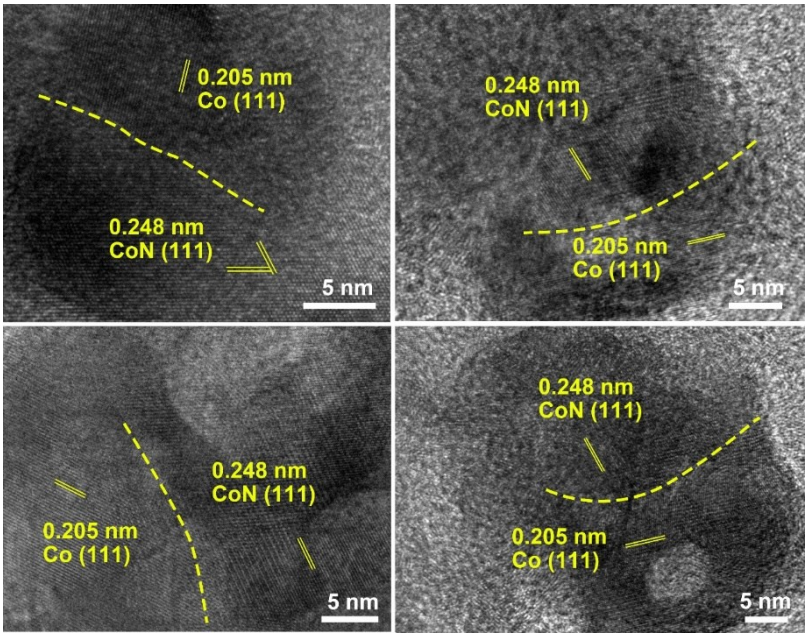


**Figure S2** TEM images for Co/CoN-NC with coexsitance of two phases.

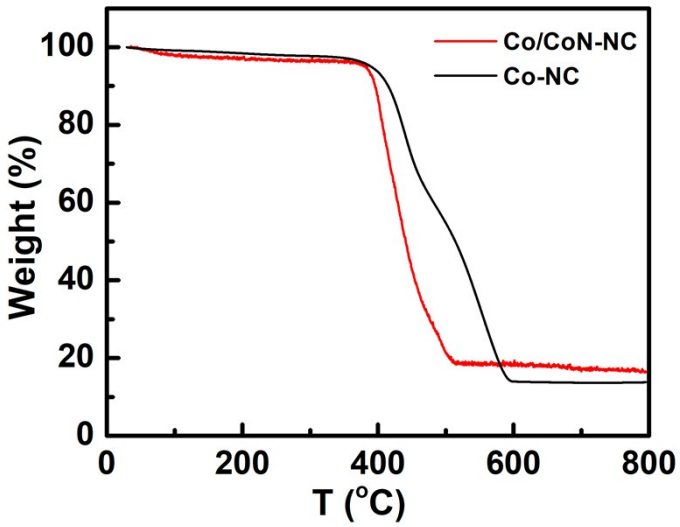


**Figure S3** Thermogravimetric curve for Co/CoN-NC and Co-NC.

**Table S1**. Chemical composition of the two catalysts.

| Catalysts | C | Co | N |
|---|---|---|---|
| **Co-NC (wt%)** | 74.37 | 10.06 | 1.25 |
| **Co/CoN-NC (wt%)** | 76.31 | 13.14 | 4.70 |

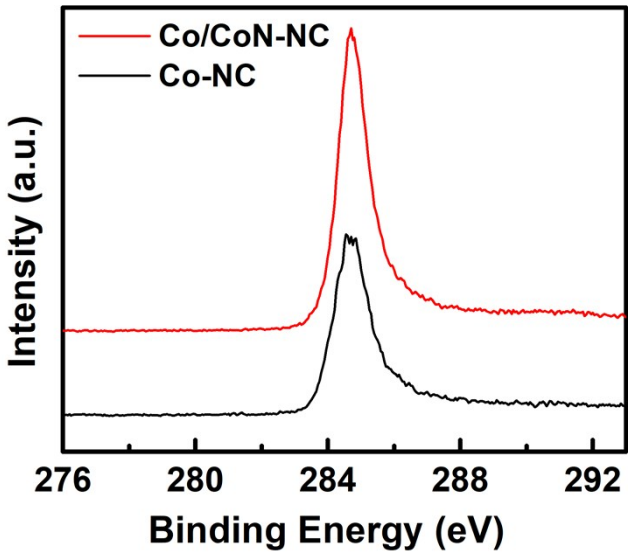


**Figure S4** C 1s XPS spectrum for Co-NC and Co/CoN-NC.

**Table S2**. Comparison of the electrocatalytic activity of transition metal nitride catalysts for HER.

| **Catalysts** | **Electrolyte** | **Overpotential at 10 mA/cm$^2$ (mV)** | **Stablility** | **Reference** |
|---|---|---|---|---|
| Co/CoN-NC | 0.5 M $H_2SO_4$ | 150 | 100 hours@ j = 10 mA/cm$^2$ | This work |
| Co/CoN-NC | 1 M KOH | 190 | 100 hours@ j = 10 mA/cm$^2$ | This work |
| $Co_{0.6}Mo_{1.4}N_2$ | 0.1 M $HClO_4$ | 200 | 3000 cycles between +0.2 to -0.3 V *vs.* RHE | *J. Am. Chem. Soc*. **2013**, *135*, 19186. |
| δ-MoN | 0.1 M $HClO_4$ | 390 | ---- | *J. Am. Chem. Soc*. **2013**, *135*, 19186. |
| MoN/C | 0.1 M $HClO_4$ | 157 | 2000 cycles between 0.3 + 0.9 V *vs.* RHE | *Angew. Chem. Int. Ed*. **2012**, *51*, 6131. |

| | | | | |
|---|---|---|---|---|
| Ni | 0.1 M $HClO_4$ | 78 | 2000 cycles between 0.3 + 0.9 V *vs.* RHE | *Angew. Chem. Int. Ed*. **2012**, *51*, 6131. |
| $W_2N$ on W | 0.5 M $H_2SO_4$ | 480 | 8 h | *Int. J. Hydrogen Energy.* **2009**, *34*, 9050. |
| $Mo_2N$/C | 0.1 M $HClO_4$ | 300 | 3000 cycles between -0.3 to +0.63 V *vs.* | *Energy Environ. Sci.*, **2013**, *6*, 1818. |
| P-WN/rGO | 0.5 M $H_2SO_4$ | 85 | 20 h @ $\eta$ = 120 mV. | *Angew.Chem. Int. Ed.* **2015**, *54*, 6325. |
| WN/rGO | 0.5 M $H_2SO_4$ | 265 | 20 h @ $\eta$ = 120 mV. | *Angew. Chem. Int. Ed.* **2015**, *54*, 6325. |
| MoN nanosh eets | 0.5 M $H_2SO_4$ | 225 | 3000 CV cycles between -0.3 to 0.2 V *vs.* RHE | *Chem. Sci.,* **2014***, 5,* 4615. |
| WN nanoarray on carbon cloth | 0.5 M $H_2SO_4$ | 198 | 60 h @ 227 mV | *Electrochim. Acta,* **2015**, *154*, 345. |
| PANICo750 A | 0.5 M $H_2SO_4$ | 138 | 40 h | *J. Am. Chem. Soc.* **2015**, *137*, 15070. |