Supporting Information

Single-crystalline CoFe nanoparticles encapsulated in N-doped carbon nanotubes as a bifunctional catalyst for water splitting

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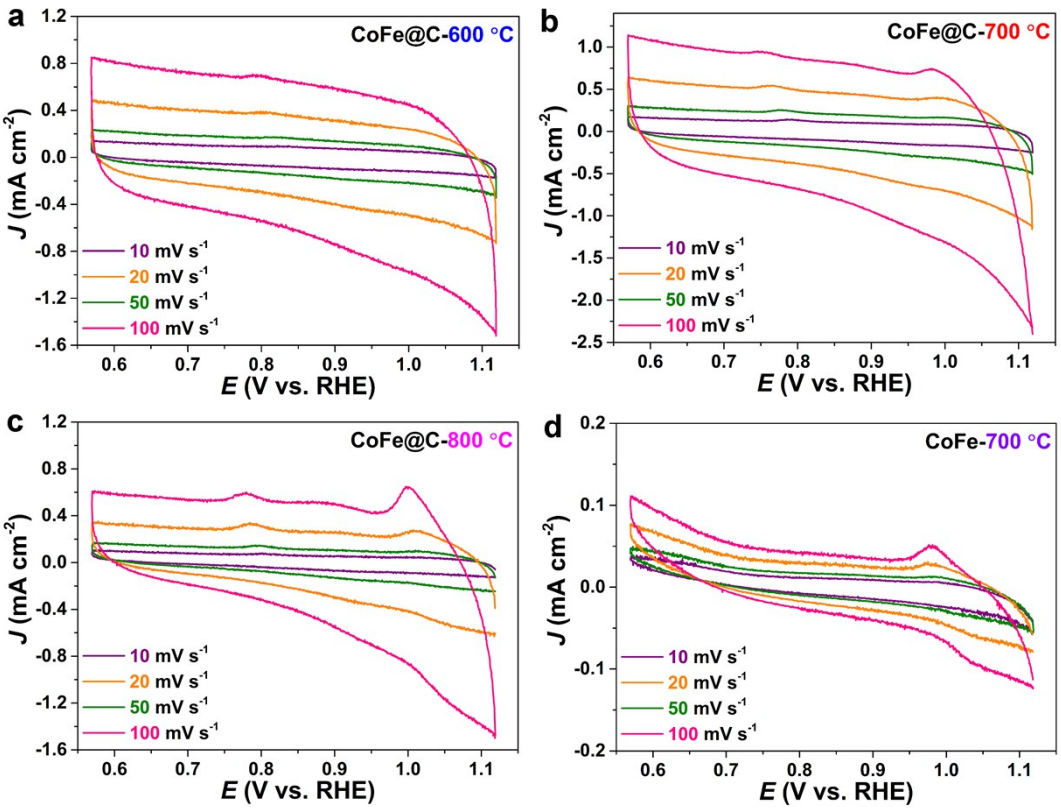

Fig. S1. CV curves for CoFe calcined at 700 °C without urea and CoFe@N-C calcined at different temperatures from 10 mV s^{-1} to 100 mV s^{-1}.

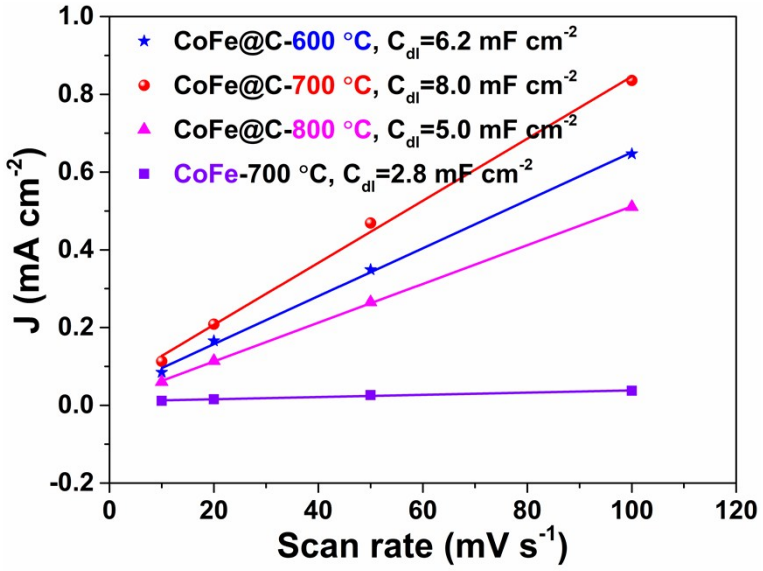

Fig. S2. C_{dl} of CoFe calcined at 700 °C without urea and CoFe@N-C calcined at different temperatures.

The electrochemical active surface area of the catalyst was estimated from the double-layer capacitance (C_{dl}) determined from the CV curves at different scan rates in a non-faradic region. Electrochemically active surface area (ECSA) was evaluated from the following equation; ECSA = C_{dl}/C_s, where C_{dl} was the electrochemical double-layer capacitance and C_s was the capacitance of an atomically smooth planar surface. [1-3] Here, C_s value of 0.04 mF cm^{-2} was used. [4] C_{dl} were calculated by the following equation; $i = vC_{dl}$, where i was the double layer current measured by cyclic voltammograms at different scan rates (v).

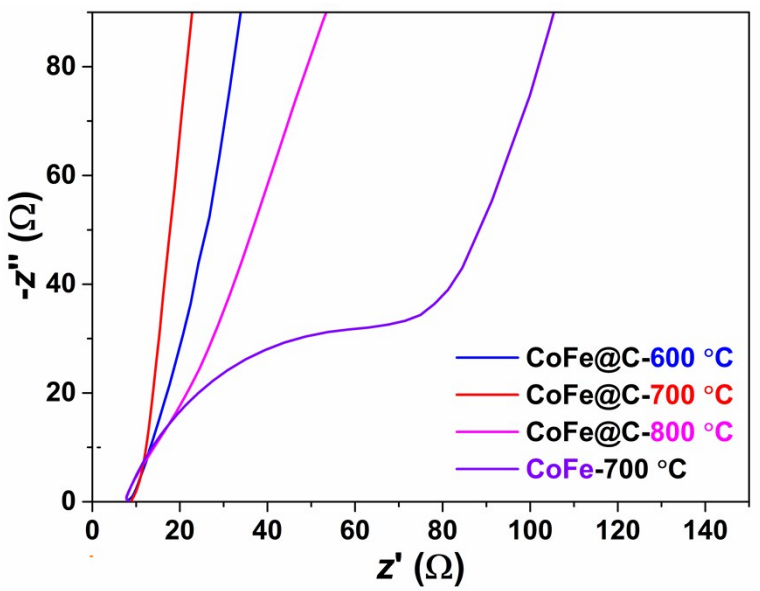

Fig. S3. Nyquist plots of CoFe calcined at 700 °C without urea and CoFe@N-C calcined at different temperatures.

Table S1. Co, Fe quantification of CoFe@N-C obtained by ICP measurements.

Sample	Co (at%)	Fe (at%)
CoFe@N-C-600	51.9	48.1
CoFe@N-C-700	48.6	51.4
CoFe@N-C-800	46.2	53.8

References

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[2] J. D. Benck, Z. Chen, L. Y. Kuritzky, A. J. Forman and T. F. Jaramillo, *ACS Catalysis*, 2012, **2**, 1916–1923.

[3] Z. P. Zhang, Y. S. Qin, M. L. Dou, J. Ji, F. Wang, One-step conversion from Ni/Fe polyphthalocyanine to N-doped carbon supported Ni-Fe nanoparticles for highly efficient water splitting. *Nano Energy*, 2016, **30**, 426–433.

[4] C. C. L. McCrory, S. Jung, J. C. Peters and T. F. Jaramillo, *J. Am. Chem. Soc.*, 2013, **135**, 16977−16987.