Supporting Information

Supramolecular Polymers-Derived Nonmetal N, S−Codoped Carbon Nanosheets for Efficient Oxygen Reduction Reaction

Zheng Kun Yang， Ling Lin， Ya-Nan Liu， Xiao Zhou, Cheng-Zong Yuan, and An-Wu Xu*

Division of Nanomaterials and Chemistry, Hefei National Laboratory for Physical Sciences at Microscale, University of Science and Technology of China, Hefei 230026, P. R. China

E-mail: anwuxu@ustc.edu.cn;

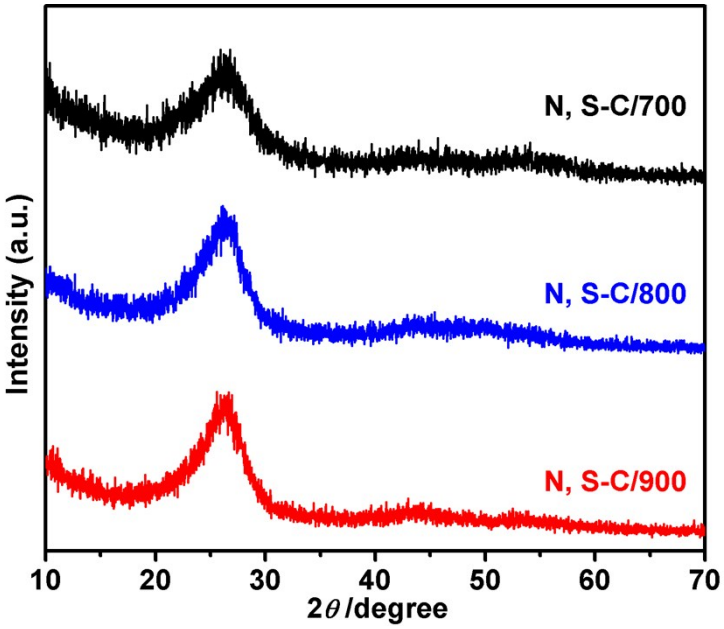

Fig. S1 XRD patterns of the N, S−C/700, N, S−C/800 and N, S−C/900 sample.

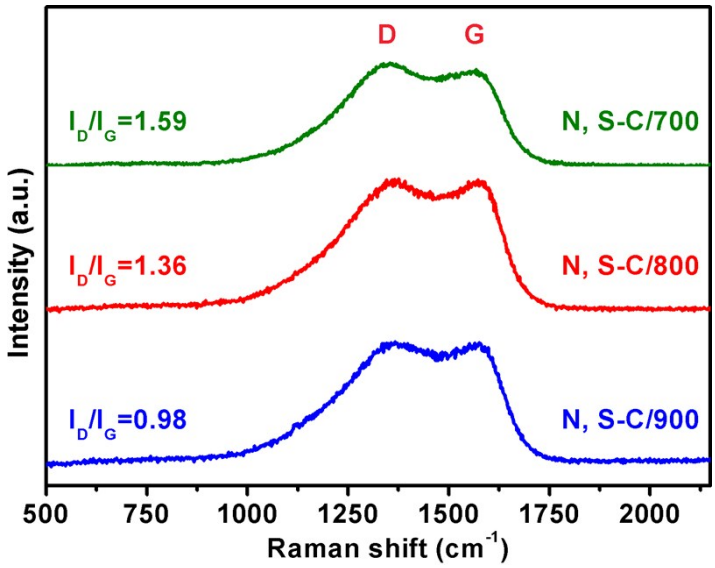

Fig. S2 Raman spectra of the N, S−C/700, N, S−C/800 and N, S−C/900 catalyst.

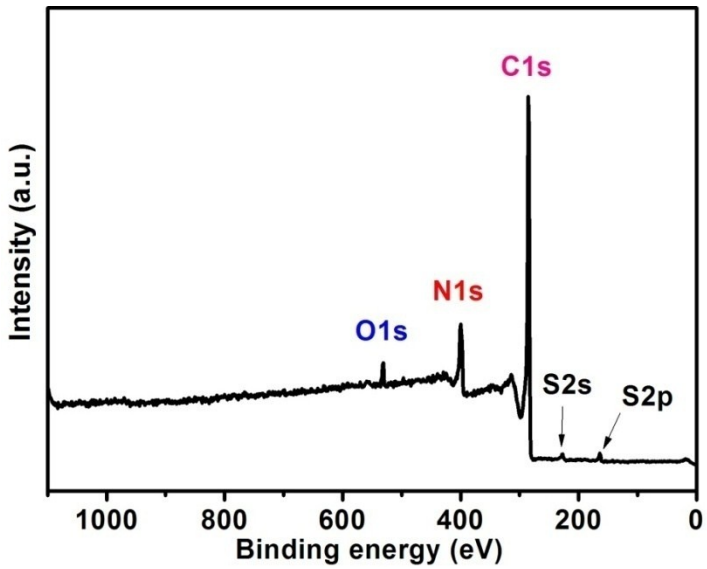

Fig. S3 XPS survey scan of the as-synthesized N, S−C/800 catalyst.

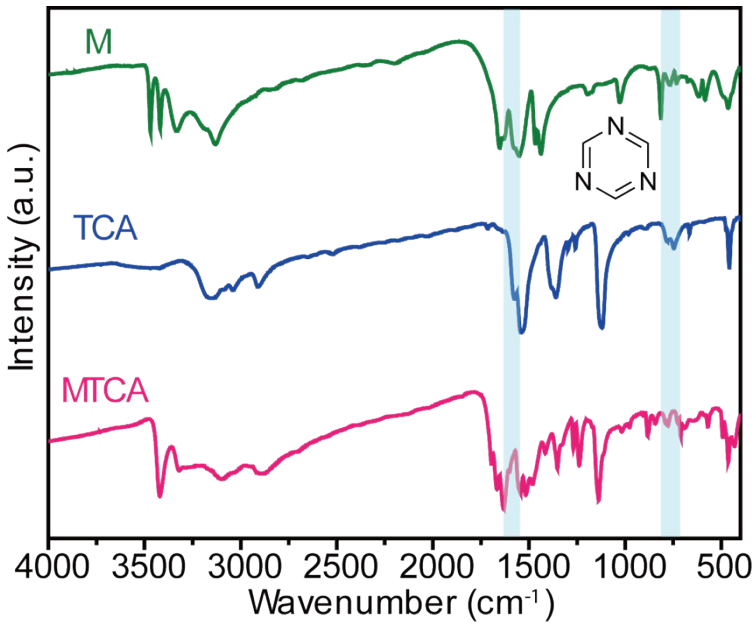

Fig. S4 FTIR spectra of MTCA precursor. For comparison, the spectra of M and TCA are also presented. The two peaks located at 1538 and 1587 cm^{-1} correspond to the C=S stretching vibration of TCA. The peak at 808 cm^{-1} is associated with the triazine ring vibration of M. Our results show that the C=S stretching vibration of TCA is shifted from 1538 and 1587 cm^{-1} to 1606 and 1635 cm^{-1}, and the triazine ring vibration of M is shifted from 808 cm^{-1} to 786 cm^{-1} for MTCA samples. This observation coincides well with the previous studies that the hydrogen bonds of N−H···S and N−H···N result in a blue shift of the C=S stretching vibration of TCA and a red shift of the triazine ring vibration of M.[1]

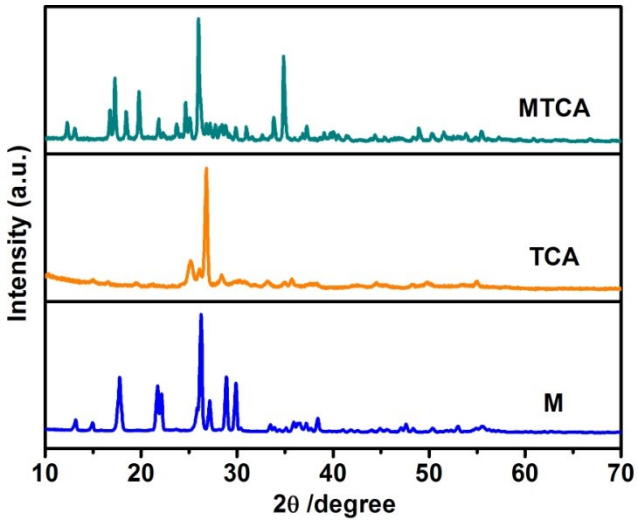

Fig. S5 XRD patterns of the M, TCA and MTCA samples.

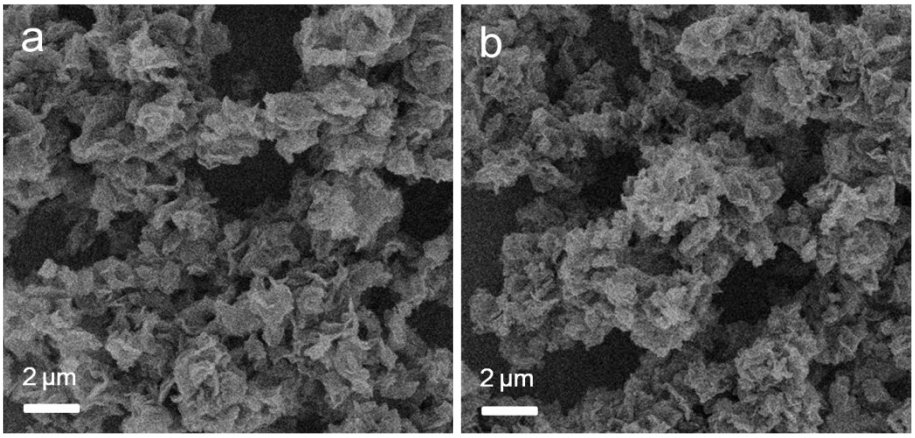

Fig. S6 SEM images of N, S−C/700 (a) and N, S−C/900 (b) catalysts.

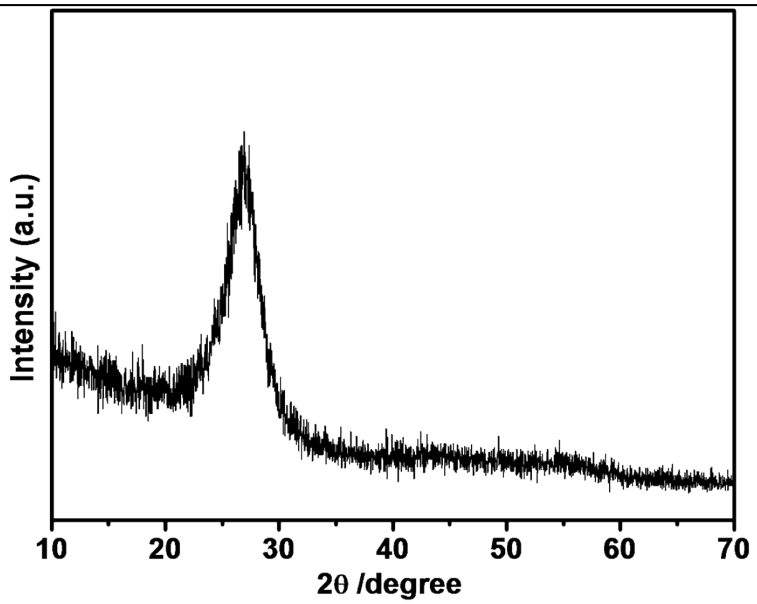

Fig. S7 The XRD pattern of the sample obtained at 550 ºC. The broad peak at 27.5° is a characteristic interplanar stacking peak of the conjugated aromatic systems, which is similar to the previous reported graphitic carbon nitride.[2]

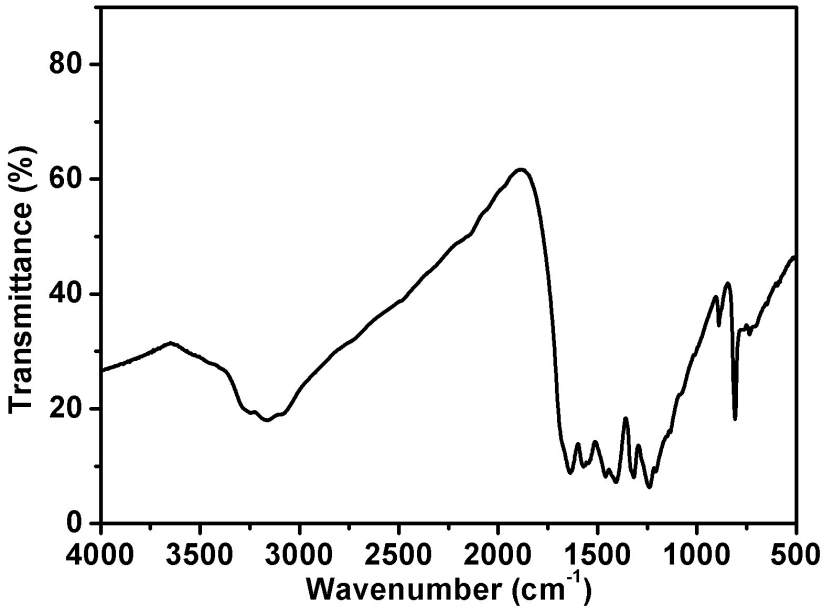

Fig. S8 FTIR spectrum of the sample obtained at 550 ºC. Several strong bands in the 1200−1600 cm^{-1} region are observed, which correspond to the typical stretching vibrations of CN heterocycles. The peak located near 800 cm^{-1} can be attributed to the characteristic breathing mode of the triazine units. This result confirms the formation of carbon nitride. [3]

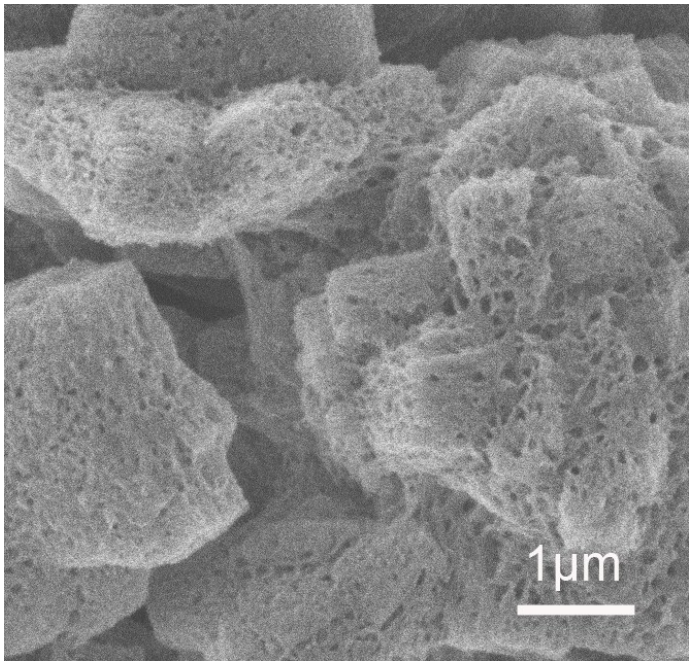

Fig. S9 The SEM image of the sample obtained at 550 ºC.

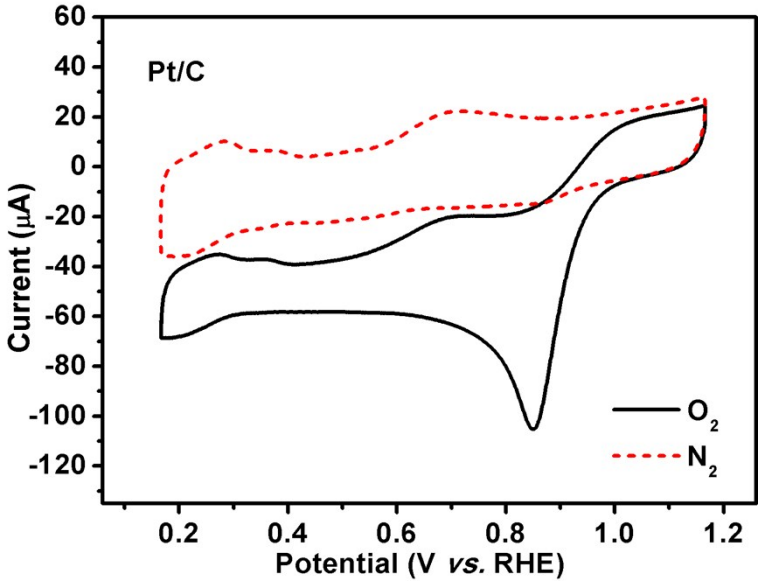

Fig. S10 CV curves of the Pt/C catalyst in N_2 or O_2-saturated 0.1 M KOH solution.

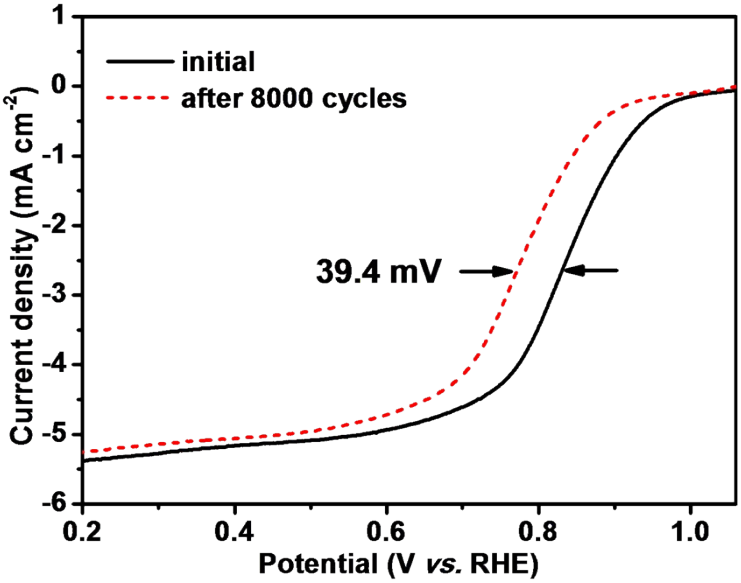

Fig. S11 LSV curves of Pt/C catalyst before and after 8000 cycles in O_2-saturated 0.1 M KOH.

References

1 Y. S. Jun, J. Park, S. U. Lee, A. Thomas, W. H. Hong and G. D. Stucky, *Angew. Chem. In. Ed.* 2013, **125**, 11289.
2 Y. S. Jun, E. Z. Lee, X. Wang, W. H. Hong and G. D. Stucky, A. Thomas, *Adv. Funct. Mater.* 2013, **23**, 3661.
3 M. Shalom, S. Inal, C. Fettkenhauer, D. Neher and M. Antonietti, *J. Am. Chem. Soc.* 2013, **135**, 7118.